OCTOBER 31, 1955

Electrical World

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This regulator *grows* with your system

Allis-Chalmers distribution regulators are equipped with the *Vari-Amp* feature. You get five current ratings from a single regulator. That can mean increases in current ratings of as much as 60% over the original rating.

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The *Vari-Amp* feature provides considerable flexibility. You can reduce ranges in 1¼% steps from ±10% down to ±5%. Range need not be equal in both directions. Set what you need — for example, 6¼% raise at 135% current, 10% lower at 100% current.

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Best of all, this convenient feature that gives you so many more uses for a voltage regulator comes at no extra cost. It gives you more for your regulation dollar because you get a lot more from a single regulator.

Get the complete story on the *Vari-Amp* feature. Call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin. A-4802

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Electrical World

Published for 81 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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for DOUBLE SHEATH PROTECTION use Okolite-Okoprene control cables

The W. B. Tuttle Plant of the City Public Service Board, San Antonio, Texas.

A modern plant—in appearance and engineering—the W. B. Tuttle Plant of the City Public Service Board of San Antonio, Texas is the city's newest installation. Okolite-Okoprene control cables are used throughout the plant to control the 66,000kw output.

Okolite-Okoprene multi-conductor control cables give *double* protection. First, each conductor is given complete terminal-to-terminal protection by its own Okoprene sheath. Second, additional protection is provided by an Okoprene sheath over the entire cable assembly.

Okoprene is highly resistant to moisture, acids, alkalies, and heat. It is nonflammable and will not be corona-cut if ozone is developed by adjacent equipment. Thus, each conductor in Okolite-Okoprene multi-conductor control cables is protected twice against these dangers. This double sheath protection guarantees long cable life and reliable, round-the-clock circuit security.

For complete details on Okolite-Okoprene control cables, write for Okonite's Bulletin EW-1056-A. The Okonite Company, Passaic, New Jersey.

A multi-conductor, color-coded Okolite-Okoprene control cable.

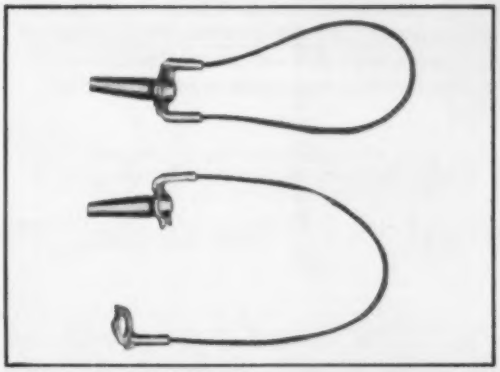
Available with either copper or aluminum conductors

OKONITE OKONITE SINCE 1878 ***insulated cables***

2709

Electroline AUTOMATIC DEAD-END

for Neutral Supported Multiple Conductor Service-Drop Cable



THE 4000 SERIES ANCHOR BRACKET

This Electroline Automatic Dead-End is designed for use with neutral-supported type of service drop. The insulation on the phase wires is not destroyed because these Dead-Ends grip only the bare neutral. This eliminates the possibility of shorting any phase. Available only for No. 6-AWG conductor. For automatic line Dead-Ends use the Electroline 3400 Series.

THE ELECTROLINE 3800 SERIES Automatic Dead-Ends lower construction costs because they are easily installed in a few seconds. This Dead-End is assembled as a one-piece unit with no loose parts to be dropped or lost. One end of the flexible bail is detachable for use with a spool-type insulator or other types of supporting anchorages now in service. This feature permits quick and easy installation with only one part, other than the conductor, to be handled by the lineman.

ELECTROLINE 4000 ANCHOR BRACKET — The 4000 Series Service Bracket, for use on permanently multi-grounded neutral systems (ideal for use with 3800 Series Dead-Ends as illustrated below), permits quick and simple insertion of a closed bail or loop—supports the cable at any angle. Installation costs are further reduced since this method of anchoring eliminates the insulator and insulator hardware.

WRITE FOR NEW BULLETINS FOR FULL INFORMATION

TALENT TO ORIGINATE · ABILITY TO PRODUCE

Electroline Company

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FLORIDA POWER & LIGHT SELECTS S&C POWER

Florida Power & Light Company is the Sunshine State's fastest growing utility. Year after year more manufacturers, more businesses, and more commercial enterprises are moving into the territory it serves. Rapid population gains have increased customers by 138%, and more than tripled demands on the Florida Power & Light system since the end of World War II.

To satisfy these demands, Florida Power & Light has carried on an extensive power expansion program which, by the end of 1955, will have required the investment of $250,000,000 since V-J Day.

For an expansion program of such importance, it is only natural that the greatest possible care is used to make sure that service continuity is maintained and system equipment is protected.

Aerial view of the Hialeah section of Miami—one of the areas where rapid building of homes and industry has increased demand for light and power to six times what it was ten years ago. Hialeah Park is nationally famous . . . open the year around . . . host to hundreds of thousands annually.

COMPANY FUSES

For example, S&C Drop-Out Power Fuses—Type SMD (marked by arrows, right) are installed at Hialeah substation to protect two 7500 kva 69/13 kv transformers which serve Hialeah Park as well as the hundreds of homes and many small industrial plants which surround it.

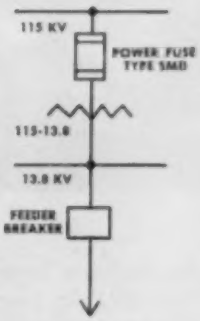
How S&C Power Fuses Are Used in the 69 Kv and 115 Kv System Protection Schemes

The transmission lines of Florida Power & Light Company are tapped at intervals to feed distribution substations. As was originally planned, the power transformers were not always provided with primary protection against secondary faults since primary breakers could not be economically justified.

After a 115 kv power transformer had been lost (for lack of such protection) the matter of protection was reconsidered. It was then decided that this protection was essential and that the device selected must meet these special requirements.

1. Provide system protection over a wide range of fault currents.
2. Coordinate with the transformer damage curve to provide maximum protection to the transformers.
3. Give complete coordination with secondary protective devices over the full range of fault currents.
4. Be capable of withstanding the recovery voltages which might be encountered under various fault conditions.
5. Be low in cost.

S&C Power Fuses, Type SMD, were found to meet all these requirements. Further details of Florida Power & Light's application of these fuses may be found in AIEE Paper No. DP 55-405.



Typical substation tapped directly from Florida Power & Light's transmission lines.

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

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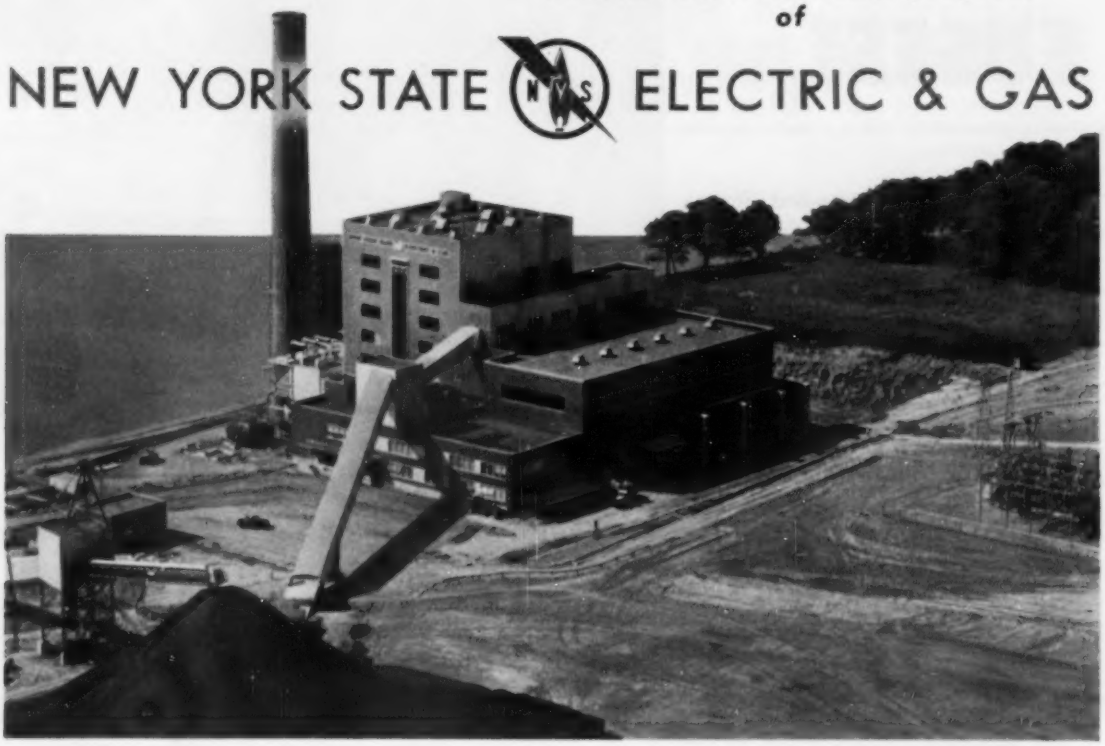

Strategically located on the east shore of Cayuga Lake near Ithaca, Milliken Station, put into operation this month, is destined to become a major source of electrical supply to south central New York State. Its 135 megawatt Turbine Generator, operating at 1800 psig with 1000° F. initial and reheat temperatures, is the foundation of an ultimate potential output of 500 megawatts.

Inter-connected with five other stations of the system, and with neighboring systems, Milliken anticipates the increasing power demands of a vital area.

We appreciate the fine co-operation of New York State Electric & Gas and the great wealth of experience brought to the job by participating manufacturers and contractors. These invaluable assets made our part in the teamwork that brought Milliken from conception to successful completion much easier.

Thanks for your help . . . and congratulations.

A SYMBOL OF GAI FOUNDED 1906 PROGRESS

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ENGINEERS AND CONSULTANTS
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They all add up to two things: *Effective* and *Economical* Line Clearance and Right-Of-Way work!

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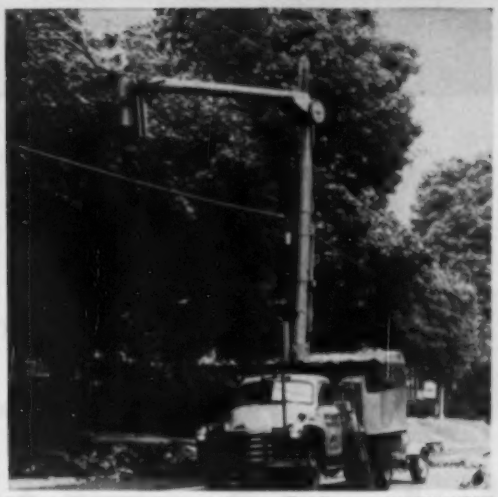
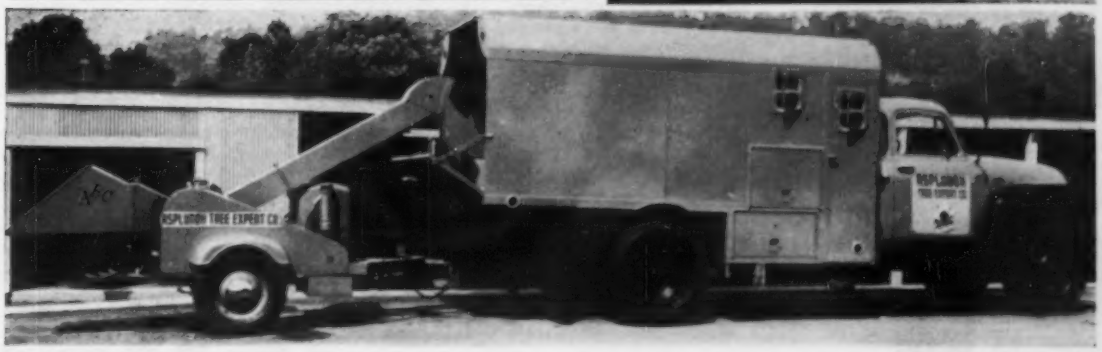
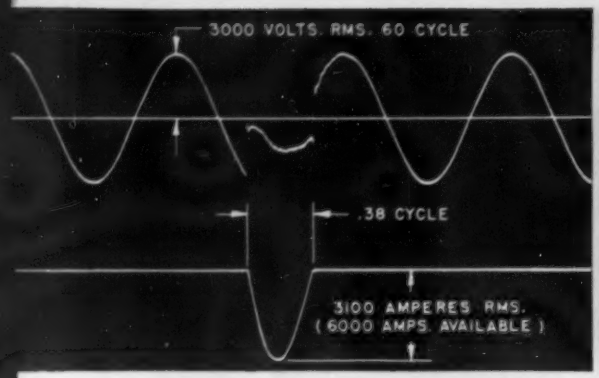
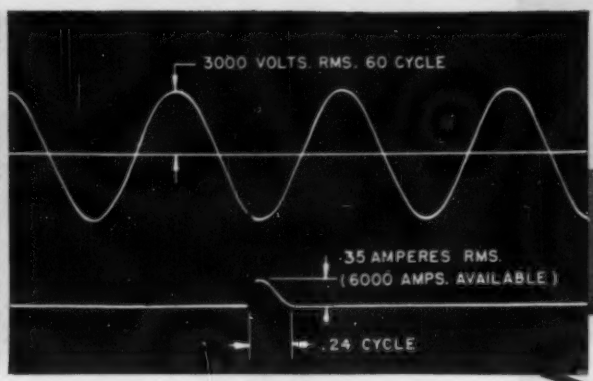








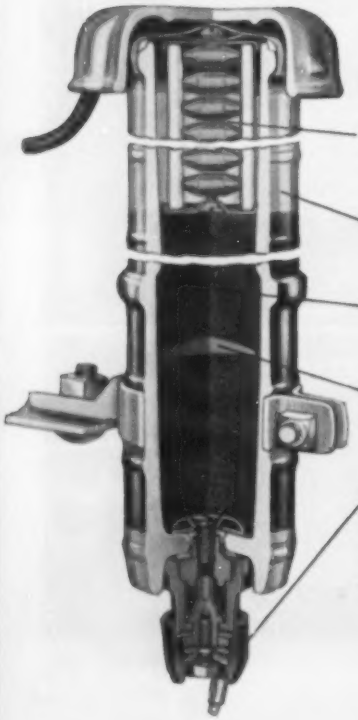
3 KV EXPULSION ARRESTER **3 KV VALVE ARRESTER**

The oscillograms show the operation of typical expulsion and valve arresters handling a lightning discharge with 6000 amperes fault current available. The expulsion arrester, left, draws 3100 amperes follow current; the valve arrester, right, draws only 35 amperes. If expulsion arresters are used, all sectionalizing fuses must be heavy enough to handle 3100 amperes for at least one-half cycle. However, if valve arresters are used, much smaller fuses can be installed, and coordination poses no problem.

FUSE COORDINATION

...another reason why

Valve Arresters Are Better



Features of L-M's Valve Arrester

1. The ladder spark gap is designed to provide a perfect balance between 60-cycle sparkover and impulse sparkover.
2. The Pyrex glass housing permits visual inspection to detect mechanical or electrical damage.
3. "Granulon," the valve material, is able to withstand severe heating which accompanies heavy strokes of lightning.
4. Lens-shaped electrodes in the element compensate for "skin effect," assuring uniform distribution of surge current throughout the valve element.
5. L-M's exclusive "Isolator" gives positive assurance against grounding feeders by instantly disconnecting the ground lead from the arrester if the arrester should ever become damaged.

FOUR PRINCIPAL REASONS

for recommending valve over expulsion type arresters

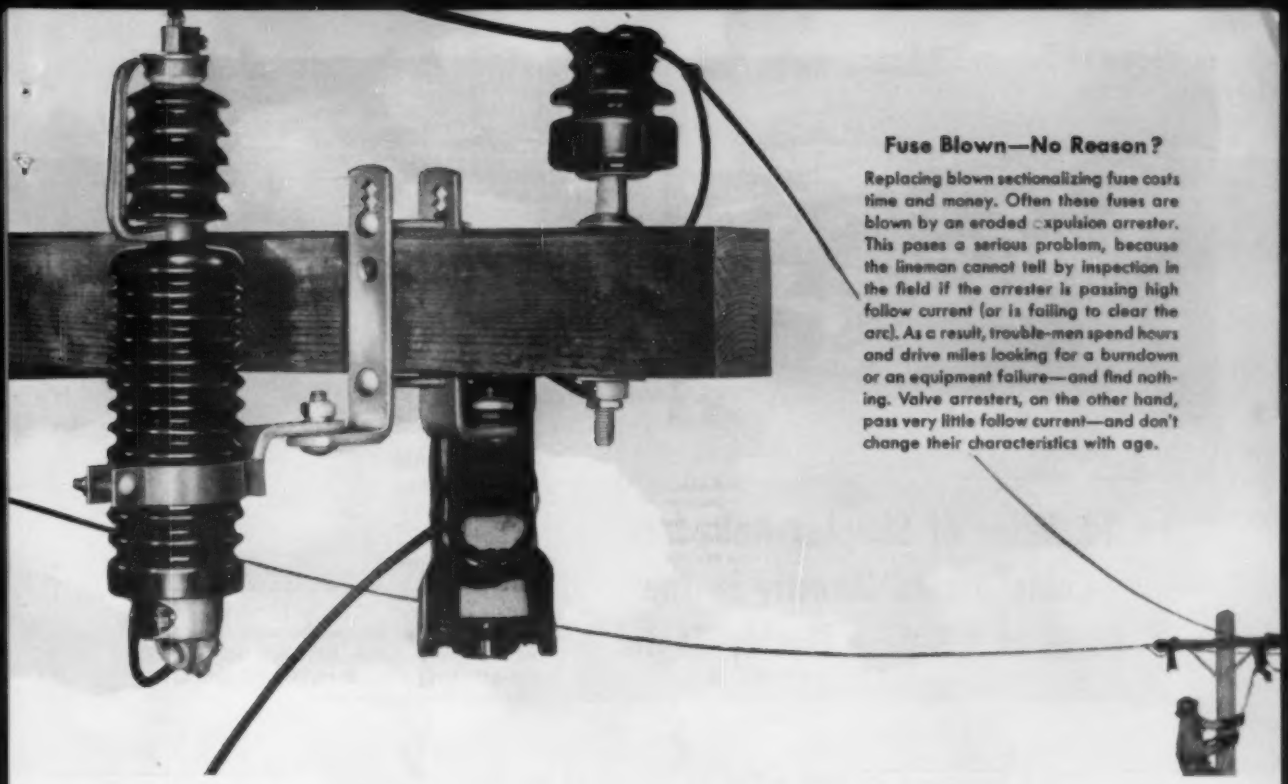
1. Better Protective Characteristics—The valve arrester sparks over more quickly and at lower voltages on lightning surges. Transformer end turns are not stressed by a complete voltage collapse following sparkover. Although the expulsion arrester provides a satisfactory level of protection for most transformers, a higher degree of protection is available through the proper application of valve arresters.

2. Unlimited 60-Cycle Capacity—The application of the valve arrester is not limited by the available short-circuit current. The expulsion arrester, operating on a pressure principle, has a definite top limit and may have a bottom short-circuit current rating. (Too much current causes it to explode; too little fails to expel the arc.)

3. No Fuse Coordination Problems—The valve arrester will pass relatively small values of 60-cycle follow current, regardless of system capacity. Expulsion arresters can pass high follow current which may cause unnecessary operations of sectionalizing devices.

4. Longer Life—The valve arrester is electrically and mechanically unaffected in handling lightning discharges usually encountered in service. Its life is relatively unlimited. The expulsion arrester ages and changes its characteristics because atmospheric conditions and erosion due to operation affect the fibre.

LM® LINE



Fuse Blown—No Reason?

Replacing blown sectionalizing fuse costs time and money. Often these fuses are blown by an eroded expulsion arrester. This poses a serious problem, because the lineman cannot tell by inspection in the field if the arrester is passing high follow current (or is failing to clear the arc). As a result, trouble-men spend hours and drive miles looking for a burndown or an equipment failure—and find nothing. Valve arresters, on the other hand, pass very little follow current—and don't change their characteristics with age.

Than Expulsion Arresters

by **H. V. DRYER**
Product Section Engineer
Protective Equipment
Line Material Company

Utility companies are frequently baffled by the extensive number of fuse outages following a lightning storm. Links are replaced —but still nobody knows why they blew.

When you compare the operations of valve and expulsion arresters, you may see why so many fuses blow on lines with expulsion arresters, and why, although we make *both* types, we at L-M say that *valve arresters are better than expulsion arresters.* The oscillograms at the left above show typical examples of power follow current through a valve and an expulsion arrester, with 6000 amperes fault current available. The valve arrester draws 35 amperes. The expulsion arrester draws 3100 amperes.

Expulsion Arresters

Therefore with this expulsion arrester, all sectionalizing fuse links must be able to handle 3100 amperes for at least half a cycle. This would require at least a 100 ampere or larger "K" link—which is impractical in many cases. Certainly such fusing gives reduced short-circuit protection and greatly increases the problem of fuse coordination.

The problem is further complicated when, after a few operations, the fibre expulsion tube erodes, and the magnitude of power follow current increases. This operation could eventually cause sectionalizing fuses to blow every time the expulsion arrester operates. This poses a serious problem because the lineman cannot tell by inspection if an expulsion arrester has passed high follow current or has failed to interrupt.

Valve Arresters

Fuse coordination is no problem with valve arresters. They pass only relatively small values of follow current, regardless of system capacity. This is true for the life of the arrester—because of the unchanging characteristics of the valve element. In the rare case of complete failure of a valve arrester, L-M provides further insurance in the form of the "Isolator," which instantly disconnects the ground so that the arrester cannot lock out feeders.

Then Why an Expulsion Arrester?

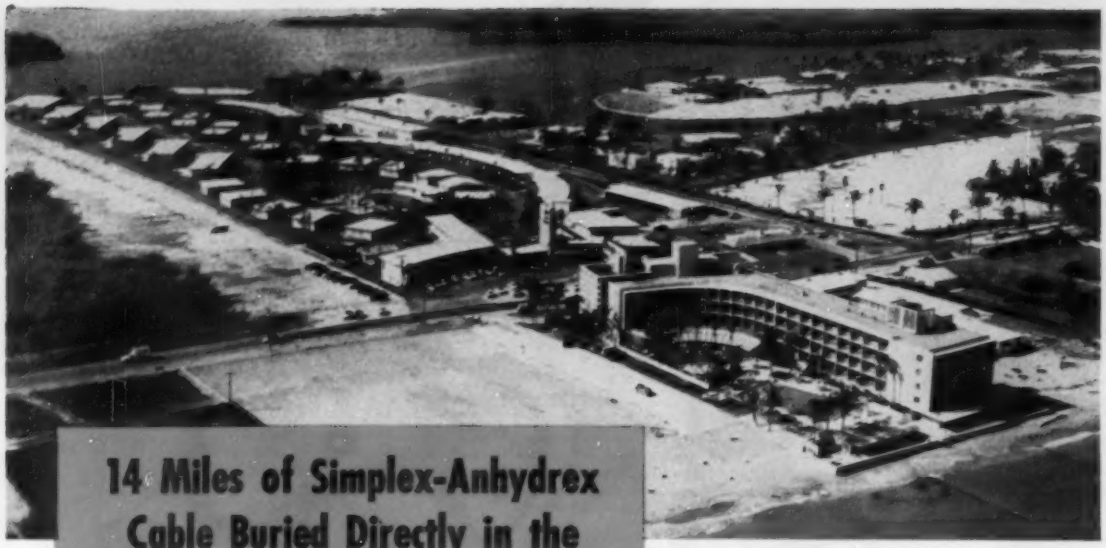
With all this evidence in favor of valve arresters, you may well ask: "Why did anybody ever make an expulsion arrester in the first place?" The expulsion arrester was created many years ago to satisfy the demands of some operators for an arrester that did not require moisture sealing. Inadequate moisture sealing of early valve arresters was the cause of many failures. Sealing has been perfected and is no longer a problem, as many operators know.

Get Complete Information

Extensive field experience has proven the superiority of the modern valve arrester. Many companies have always used valve arresters, and many others are changing to valve arresters.

Details of some of the extensive evidence in favor of valve over expulsion arresters are given in a new booklet, "Valve Versus Expulsion Arresters." Whichever type you use, we believe you'll be interested in this report. Ask your L-M Field Engineer for a copy, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

MATERIAL Lightning Arresters



14 Miles of Simplex-Anhydrex Cable Buried Directly in the Earth at 28-Acre Florida Motel

Florida hotel-motel development, where ANHYDREX Cable is buried, showing Atlantic Ocean (lower right) and part of Biscayne Bay (upper left).

Installed in four miles of trenches to guard against tropical storms and preserve resort atmosphere

This swanky 650-room motel development, just completed in Miami Beach, depends almost entirely on Simplex-ANHYDREX 600-volt cable for power for air-conditioning, lighting and a myriad of other uses.

One of the largest direct-burial, underground distribution systems of its type in the South, the cable is insulated with Anhydrex which resists water, heat and oxidation.

A neoprene jacket protects it against soil acids, abrasion, oil, moisture and mildew.

For economical, safe, neat-looking direct burial, underground distribution systems, investigate Simplex-ANHYDREX Cable.

Call the Simplex representative nearest you, or write to the address below.

Simplex

ANHYDREX Cable

A product of SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Massachusetts

Designed and built to specifications you might have written...

Power Capacitor Specifications
1. Corrosion protection - even though case finish is scratched.
2. Solder-sealed porcelain bushings.*
3. Reliable performance at low ambient temperature.
4. Suitable for vertical or horizontal mounting.
5. Low losses.
6. Low temperature rise.
7. Stability under all operating conditions.
8. Terminal connectors for either copper or aluminum.

SANGAMO POWER CAPACITORS

* This solder-to-porcelain bonding technique permanently and hermetically seals the all-weather porcelain bushing to corrosion-proofed metal fittings. Induction soldering then seals the bushing assembly directly to the case. The bond is so strong that the capacitor can be readily handled by its terminals without the slightest danger of disturbing the seals.

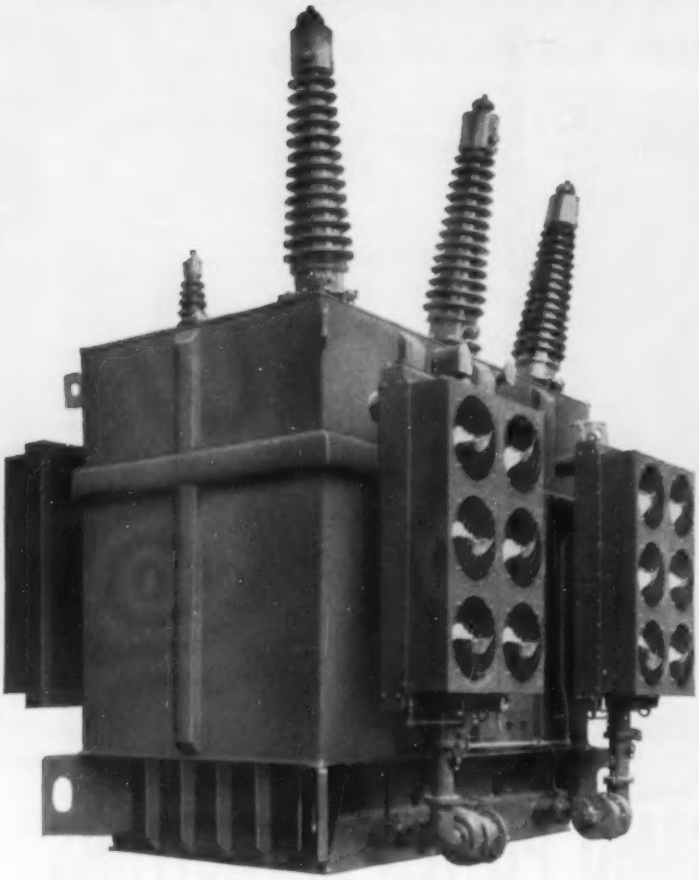
Some of the utility men we talked to particularly liked the idea of the Sangamo Capacitor's heavily tin-plated terminal parts. This tin-plating practically does away with corrosion problems with either copper or aluminum conductor. The parallel groove clamp makes connections easier... two conductors from #8 solid to #4 can be inserted without removing the terminal nut.

For more details on this power engineer's capacitor, write today for Bulletin 1120.

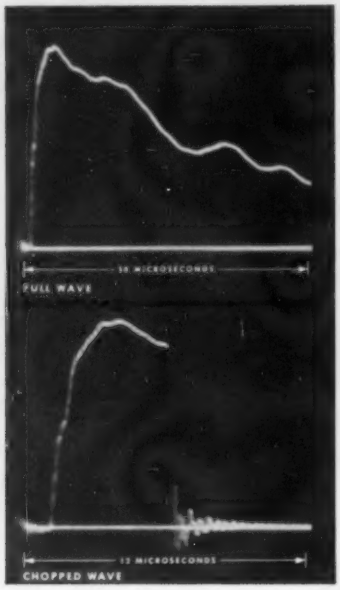
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

PC55-4



Oscillograms of basic types of impulse test waves, proving Westinghouse power transformer quality.



ONLY AT WESTINGHOUSE . . .

IMPULSE TESTING is now standard procedure for all large power transformers

In 1931, Westinghouse pioneered impulse testing of power transformers . . . now again in 1955, Westinghouse leads the industry in announcing the impulse testing of *every* power transformer rated above 10,000 kva and 69 kv and above. Each one . . . quality controlled . . . on the production line. These tests, which long have been a Westinghouse extra of quality manufacturing, are now standard procedure—an added assurance of ability to withstand all voltages encountered in service.

Basically, impulse testing proves the dielectric strength of transformer insulation. The searching power of these surge voltages proves the soundness of design, materials, and craftsmanship.

Conducted with surge generators of over three-million-volt capacity, these tests produce typical wave shapes encountered in service. The sequence—one full wave at reduced level (50% to 70%), then two chopped waves and one 100% full wave. This testing under actual operating conditions is doubly important when service to customers is more dependent on larger blocks of power.

For more complete information on this added assurance of transformer dependability, call your Westinghouse sales engineer, or write Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa. J-70754

YOU CAN BE SURE . . . IF IT'S

Westinghouse

When you're offered oils "just as good" as Gargoyle D.T.E., remember these facts...

Have you ever wondered why, so very often, you're urged to buy an oil that's "just as good as Gargoyle D.T.E."? The reason is simple...Industry has always accepted Gargoyle D.T.E. hydraulic oils as the *standard of quality* in this field!

These substitutes may have *some* of Gargoyle D.T.E.'s properties—but *none* measures up in all-round performance! Gargoyle D.T.E. hydraulic oils last longer—have given excellent service, in many cases, for thousands of hours! They boost machine efficiency—improve production and quality—help reduce manufacturing costs. That's why—although Gargoyle D.T.E. costs a trifle more (often as little as *one mill* per machine per hour) they actually save you money in the long run!

And here's an *extra* plus . . . the world's greatest lubrication engineering service goes with these famous oils—*at no extra cost!* So why settle for less than the best? Call us today!

Socony Mobil

Correct Lubrication

FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION
Formerly Socony-Vacuum Oil Company, Inc.

ANOTHER REASON WHY UTILITIES EXPECT MORE FROM POWERS-AMERICAN AERIAL EQUIPMENT

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Sky-Master®

HYDRAULIC AERIAL BEAM

For Placing Workmen in

"HARD-TO-REACH PLACES"

UP·OUT·OVER·DOWN

Getting to out-of-the-way, hard-to-reach working areas is a breeze with Sky-Master. Twin, insulated work baskets carry workmen up, out, over, or down . . . provide on-the-ground comfort that speeds up overhead work.

Sky-Master—with accessory equipment for your job—can be furnished on a Powers-American Body that fits your exact requirements. Literature and prices on Sky-Master—in a size for reaching 42′ or 48′ above ground—will be sent on request.

Powers-American Division

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO. 625 CEDAR STREET • BERKELEY 10, CALIF.

The link between you and satisfied customers

KEARNEY
FUSE LINKS

To restore service faster

Linemen work faster when all they need to do is pull the handy KEARNEY Fuse-Pak tab to unpack a fuse link. It's by far the most efficient method of packing . . . particularly when men are wearing heavy gloves and working in bad weather. As an added help, every KEARNEY Fuse-Pak is brightly color-coded to save time and prevent mistakes.

To prevent unnecessary outages

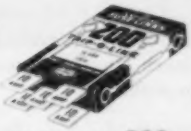
You can keep even the most troublesome circuits in operation safely with these "coordination-engineered" KEARNEY Fuse Links. They are available in six types to suit your particular requirements:

KEARNEY Type KS

Specially designed to protect and still keep outages at a minimum on circuits subject to switching and lightning surges. KS overload capacity is identical with Type 200, but surge capacity is twice as great.

KEARNEY Type X

A specialist at keeping transformers in service during heavy overloads and surges... yet clears the fault before damage range is reached. Opens 230% of rated current within five minutes.



KEARNEY Type 200

Specially made for troublesome circuits that are subject to long-time overloads and surges. Overloads up to 150% can be carried indefinitely without damage to fuse link or cutout.

KEARNEY Type QA

The QA link is designed to open at a lower percentage of rated current, and therefore will melt more rapidly than fuse links of the same ampere rating which have been designed to open 230% of rated load within five minutes.

KEARNEY Type K

EEI-NEMA standard fast fuse link.

KEARNEY Type T

EEI-NEMA standard slow fuse link.

JRK-283

For Better Construction . . . Safer Maintenance

Specify **KEARNEY PRODUCTS**

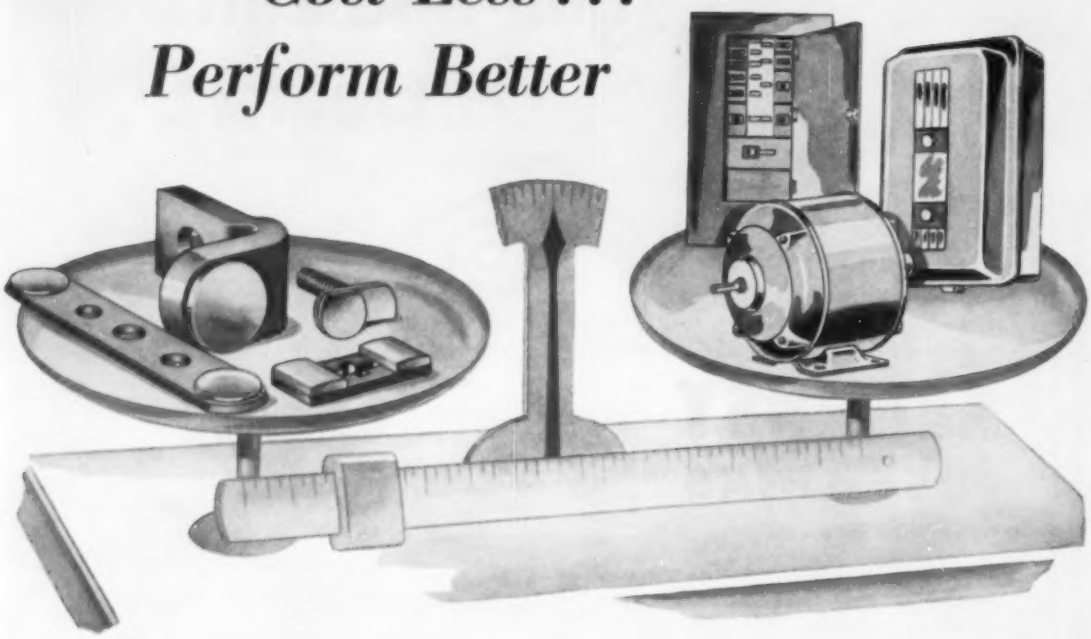
JAMES R. KEARNEY

The Mark of Quality

JAMES R. KEARNEY CORPORATION • 4224-42 CLAYTON AVENUE, ST. LOUIS 10, MISSOURI • Canadian Plant: GUELPH, ONTARIO

Contacts BALANCED to Their Job

Cost Less . . .
Perform Better



Balanced design pays dividends in the electrical contacts you use in your product. *Under-designing* of contacts can detract from the performance of your product and lead to troublesome, costly maintenance. *Over-designing* makes your contacts cost too much for the job they must do . . . and subtracts from your profits.

To engineer contacts to the specific requirements of your application, important environmental factors must be precisely weighed. Current and voltage to be interrupted . . . nature of the load circuit . . . anticipated life . . . number and frequency of make-and-break cycles . . . contact pressure and gap . . . ambient temperature and atmosphere . . . all demand careful consideration.

To be sure of getting contacts that meet all these requirements . . . at a cost that matches your application . . . bring your contact problems to Mallory. During more than thirty years of working with leading manufacturers of varied types of equipment, Mallory has developed not only an unequalled line of contact materials, but also a broad background of experience in contact design.

Our engineers will be glad to investigate your problem . . . to recommend the most effective Mallory contact material. Perhaps one of the many Mallory *standard* designs will meet your requirements. If not, Mallory engineers are well qualified to develop a *special* contact for your purpose. You can probably make additional savings, too, by having Mallory fabricate complete contact assemblies in our integrated manufacturing department.

Write today for a consultation with a Mallory engineer, and for a copy of our latest Contact Catalog.

Expect more . . . Get more from

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

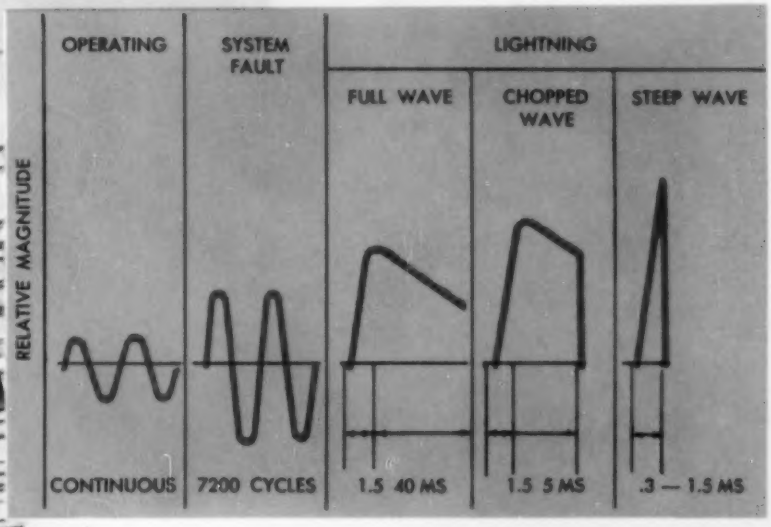
Serving Industry with These Products:

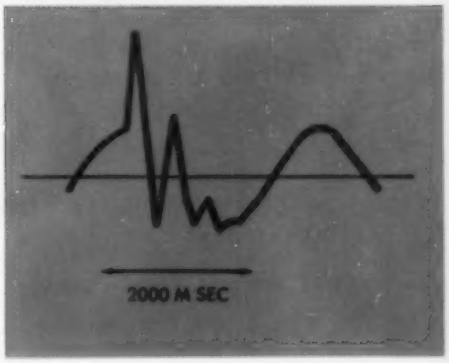
Electromechanical — Resistors • Switches • Television Tuners • Vibrators
Electrochemical — Capacitors • Rectifiers • Mercury Batteries
Metallurgical — Contacts • Special Metals and Ceramics • Welding Materials

ALLIS-CHALMERS

New Proposed Standard Test Voltage for Switching Surge

Opens Way To Revolution In System Economics

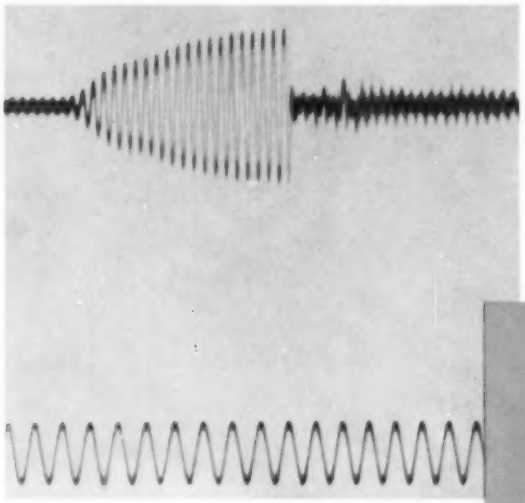




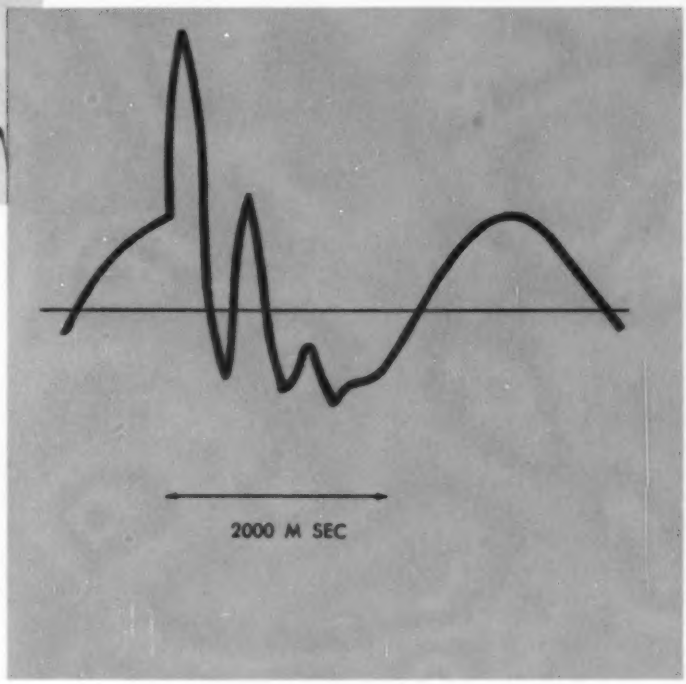
These Tests Plus This Test *Provide the Proof*

A-4797

Now Available – First Step



Switching Surges Result from many factors, including line characteristics, length of line involved, ability of breakers to disconnect without restriking, and other complexities. The surge is generally an oscillation, shown below. New test, shown at left, is designed to be more severe than switching surge experienced in operation.



New Test Provides Answer To Unknown Performance Factor

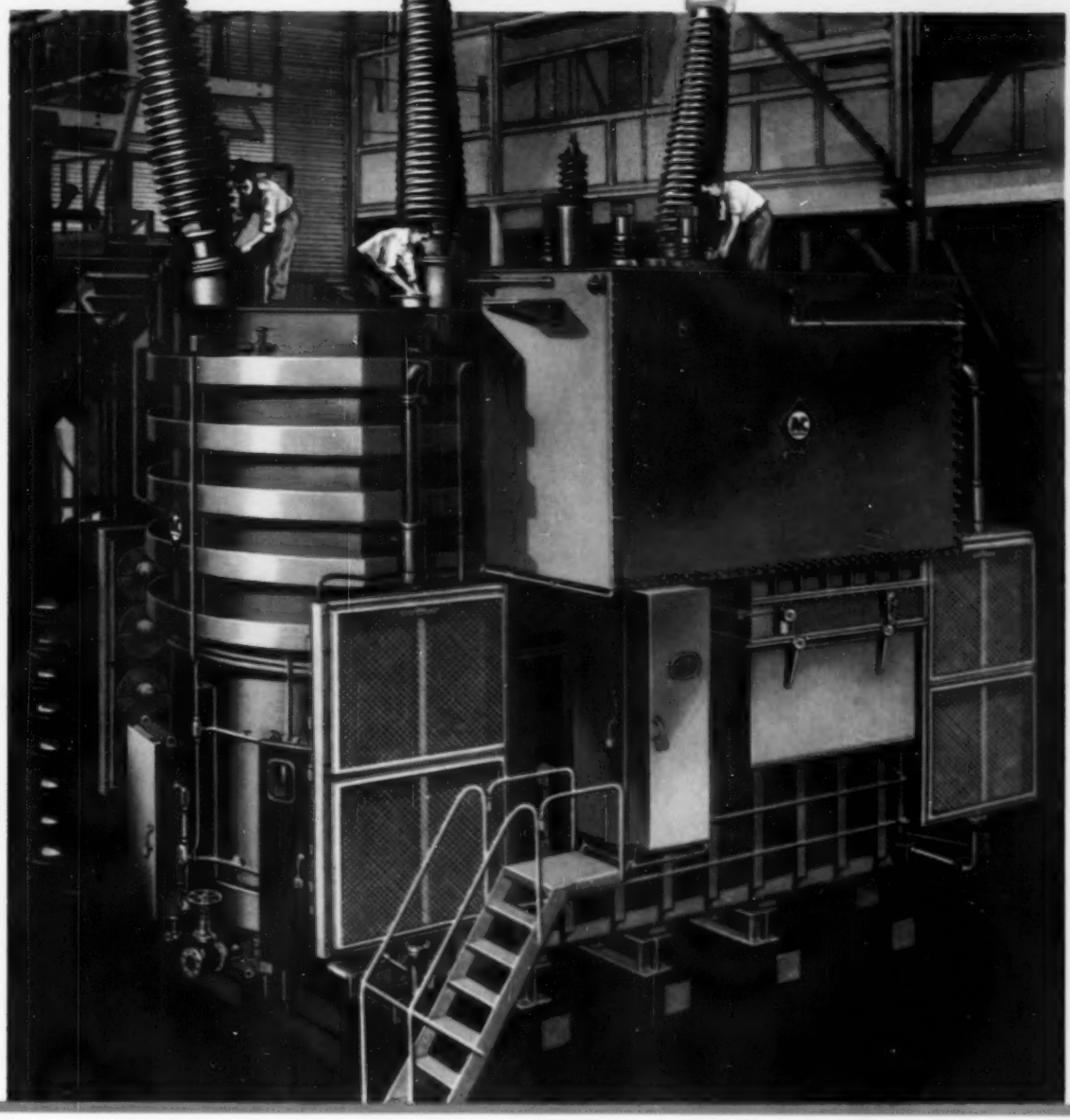
ALLIS-CHALMERS now guarantees switching surge strength for power transformers for systems 115 kv and higher. Eliminating a major unknown factor in transformer performance, Allis-Chalmers provides system designers with all the information they need to coordinate power transformers with protective equipment.

This is the first step toward establishment of new insulation design which may result in major cost reductions. Without this new test, the unknown factor of switching surges often makes it necessary to maintain other test voltages at unrealistically high levels. Now all phases of transformer performance can be evaluated more practically. New lower insulation levels can be established. The final result can be adequately protected transformers at considerably lower cost.

Complete information on how these tests may affect transformer design and change system economics is outlined in a new AIEE paper "Insulation Application of Modern Power Transformers." For a copy, see your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-

to System Cost Reduction



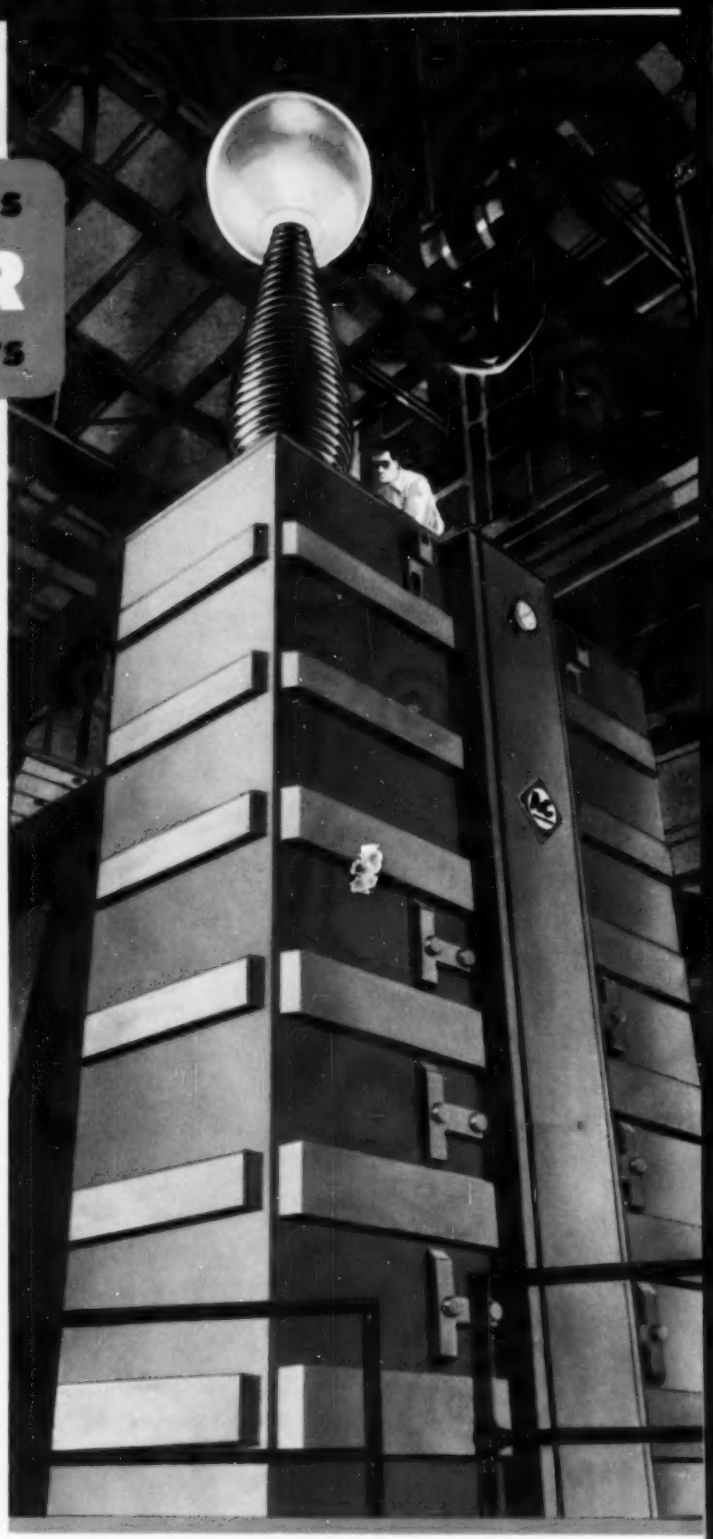
Insulation Quality Standards developed by Allis-Chalmers through its corona-free design program make possible new switching surge tests. Years of research have gone into materials, shapes, and a great variety of designs for the thousands of points in a transformer where corona may develop unless design and test precautions are taken. Now, with new tests, system designers will be able to fit completely known quantities into their systems by specifying Allis-Chalmers power transformers.

CHALMERS

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

POWER Transformers



600-Kv Transformer Provides Answer To Utility Problems

This is the highest voltage commercial-type power transformer ever built. Successful completion of tests shows that system designers now have a proved means for raising transmission voltages far beyond present levels. These tests also prove the quality of new insulation techniques developed by Allis-Chalmers.

After completion of all test operations, this transformer was added to the extensive facilities Allis-Chalmers maintains for power transformer research. It provides a means for practical study of new developments like the switching surge application outlined on the preceding pages.

Acoustical Research, Too

Allis-Chalmers research continuously takes into consideration problems of utility engineers as well as problems of product improvement. An example is the introduction of the Carrollville Acoustical Proving Ground last year. This outdoor sound facility, covering ten acres, provides utilities with a unique opportunity for finding a practical, economical solution to sound problems.

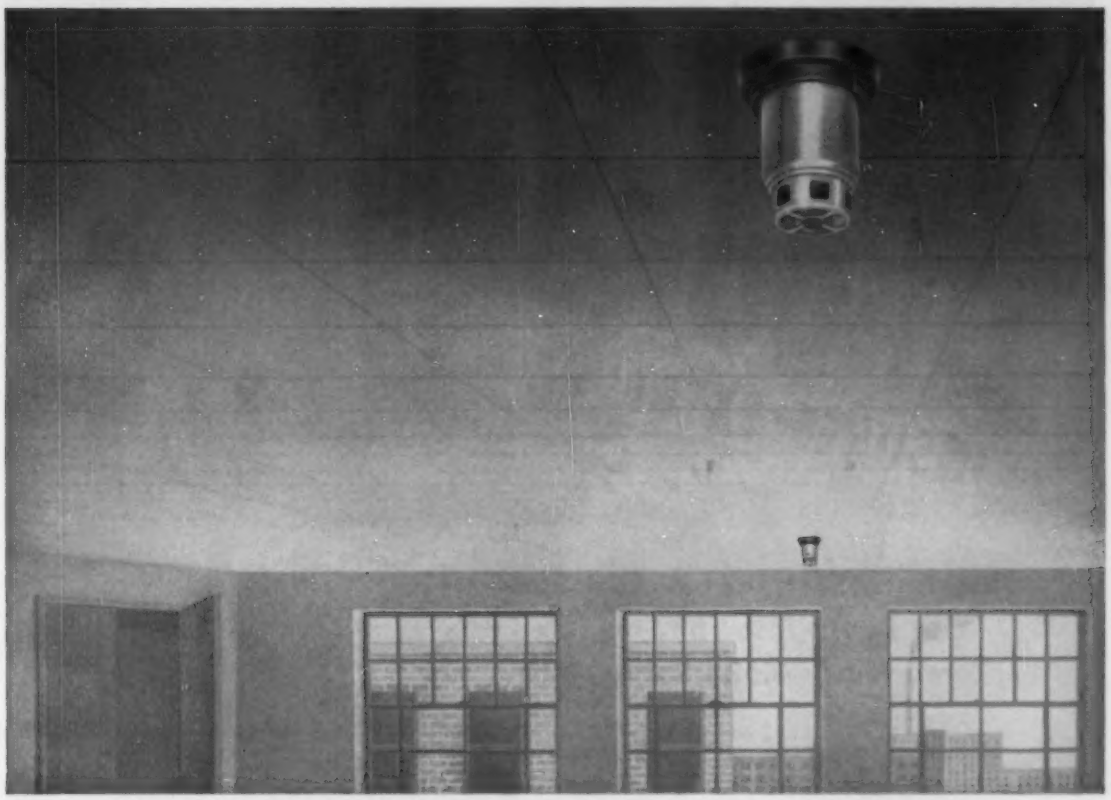
Information on any of these Allis-Chalmers developments is available by calling on a nearby Allis-Chalmers office. Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

New, radio-active, automatic fire guard!

C-O-TWO PRE-DETECTOR SYSTEM



Each pre-detector head protects up to 3,600 square feet of area . . . harmless radio-active element utilizing ionization chamber principle quickly detects all forms of fire . . . requires only simple two-wire circuit and insignificant wall space for controls.

This completely new and positive means of spotting fire is just what you've always needed and wanted . . . detects in the earliest stage, invisible combustion gases, visible smoke, slow smoldering, as well as open flame. The C-O-TWO Pre-Detector System is simple to install, extremely economical to maintain and doesn't depend on thick smoke or heat for actuation.

As many pre-detector heads as necessary can be connected together in a single circuit and up to 16 separate circuits or spaces handled by one system. With a single circuit the pre-detector heads are connected directly to the fire indicating cabinet, while with multiple circuits the pre-detector heads are first connected to one or more space indicating cabinets capable of visually showing by number the exact location of the fire. Relays perform such functions as sounding alarms, closing fire doors, shutting down ventilation and releasing fire extinguishing systems.

The C-O-TWO Pre-Detector System has been subjected to extensive testing and carries Underwriters' Laboratories, Inc. listing, as well as Factory Mutual Laboratories approval. Proven pilot installations have been made in such diversified properties as a television station, an electric power company network analyzer room, a railroad signal tower, an airline flight training equipment room and the offices of an insurance company.

Don't take unnecessary chances any longer . . . the extensive fire protection experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Get complete facts about this new C-O-TWO Pre-Detector System today!

Pyrene

PYRENE — C-O-TWO

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

C-O-TWO

COMPLETE FIRE PROTECTION

portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM

DEEP DEEP GROUNDING

INSURES EXTRA PROTECTION

• Heat treated, alloy steel driving stud resists mushrooming — can be used over and over. Couplings of rugged Silicon Bronze.
• Completely copper-covered machined point speeds driving. All rod sections are threaded on both ends for use as top, intermediate or bottom section.
Permanently Moist Soil
BLACKBURN Sectional COPPER BONDED GROUND RODS

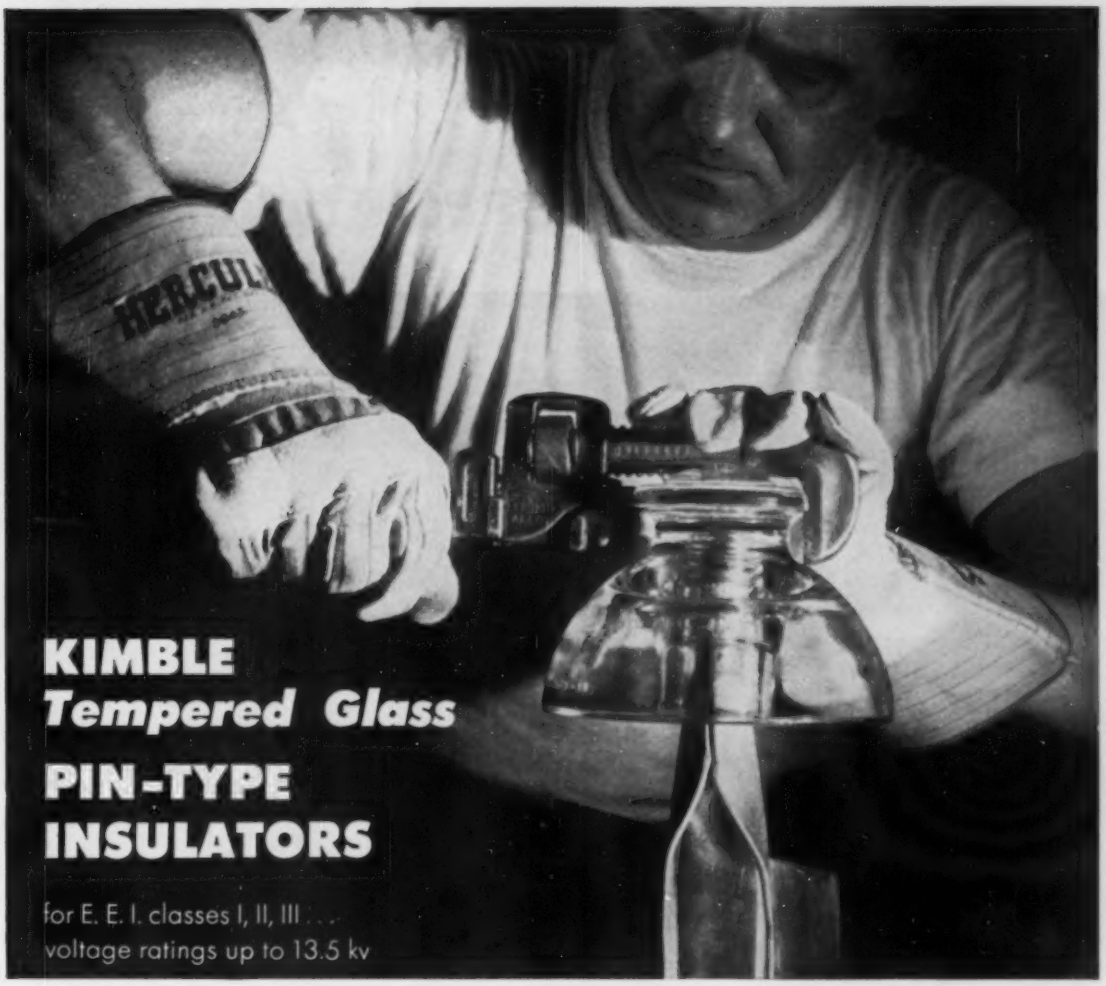
Blackburn Sectional Rods Get Down Into The Permanently Moist Soil

Drive down to permanently moist soil that gives lower earth to rod resistance. Actual experience shows a few dollars invested in deep grounding has saved thousands of dollars in overhead burn-outs.

- BLACKBURN Sectional Rods have a uniform coating of highly conductive corrosion-resistant copper, molecularly bonded to *rigid steel core.*
- Driving studs and couplings interchangeable with all standard sectional ground rods.
- Available through Electrical Distributors.

JASPER BLACKBURN CORPORATION
35 Madison Street • St. Louis 6, Missouri
Phone MAin 1-2821

Distributed on the West coast by KORTICK MFG. CO.



Stronger than the pin that supports it

SO STRONG . . . Torque test shows strength sufficient to strip threads on lead bushed pins and actually twist pole top steel pins.

This great strength saves installation time. It is not necessary to loosen Kimble tempered insulators for line-up with the conductor. Their strength will always allow another quarter-turn.

If it's on the pin, it's in service

In the event of shattering due to severe mechanical shock, insulator disintegrates into many small, non-sharp fragments. Trouble shooters can locate broken insulators—fast.

What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

Why not see how tempered glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Glass Company, subsidiary of Owens-Illinois, Dept. EW-10, Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

SPECIALLY BUILT

"Rhino"

LINE TRUCKS FOR 2-MAN CREWS!

This truck has a nose for work—work that conventional trucks can't really handle. The "Rhino" is specially built to take the rugged stress and strain from front-mounted derrick and digger with a live front axle rated at 9500 pounds—50% stronger than ordinary truck axles. The long, powerful front spring suspension is FWD-Engineered to take massive front end workloads.

2-MAN OPERATION
Saves Man-hours

The Rhino's front-mounted derrick and/or digger works out-front where the driver has a full view of the job being done. No need to jockey back and forth with extra men giving directions. Just drive into position where the No. 2 man guides the earth borer or swings the pole base into place. Two men do the work of five with better control, lower cost.

DIG MORE HOLES
Set More Poles... Travel Anywhere

The FWD "Rhino" does it all faster, cheaper! Load it down with equipment and move off to the job—fast and smoothly down the road, steadily and safely through the roughest off-highway terrain. You dig more holes, set more poles **anywhere** with the versatile and economical Four Wheel Drive "Rhino."

Send for illustrated "Rhino" folder for your equipment file. There is an FWD Utility Specialist near you who can give you the "Rhino" working profit and safety story without obligation. Call collect for his name.

THE FOUR WHEEL DRIVE AUTO COMPANY

TO TAKE HEAVY FRONT-END LOADS

OUTPERFORMS CONVENTIONAL OR CONVERSION TRUCKS!

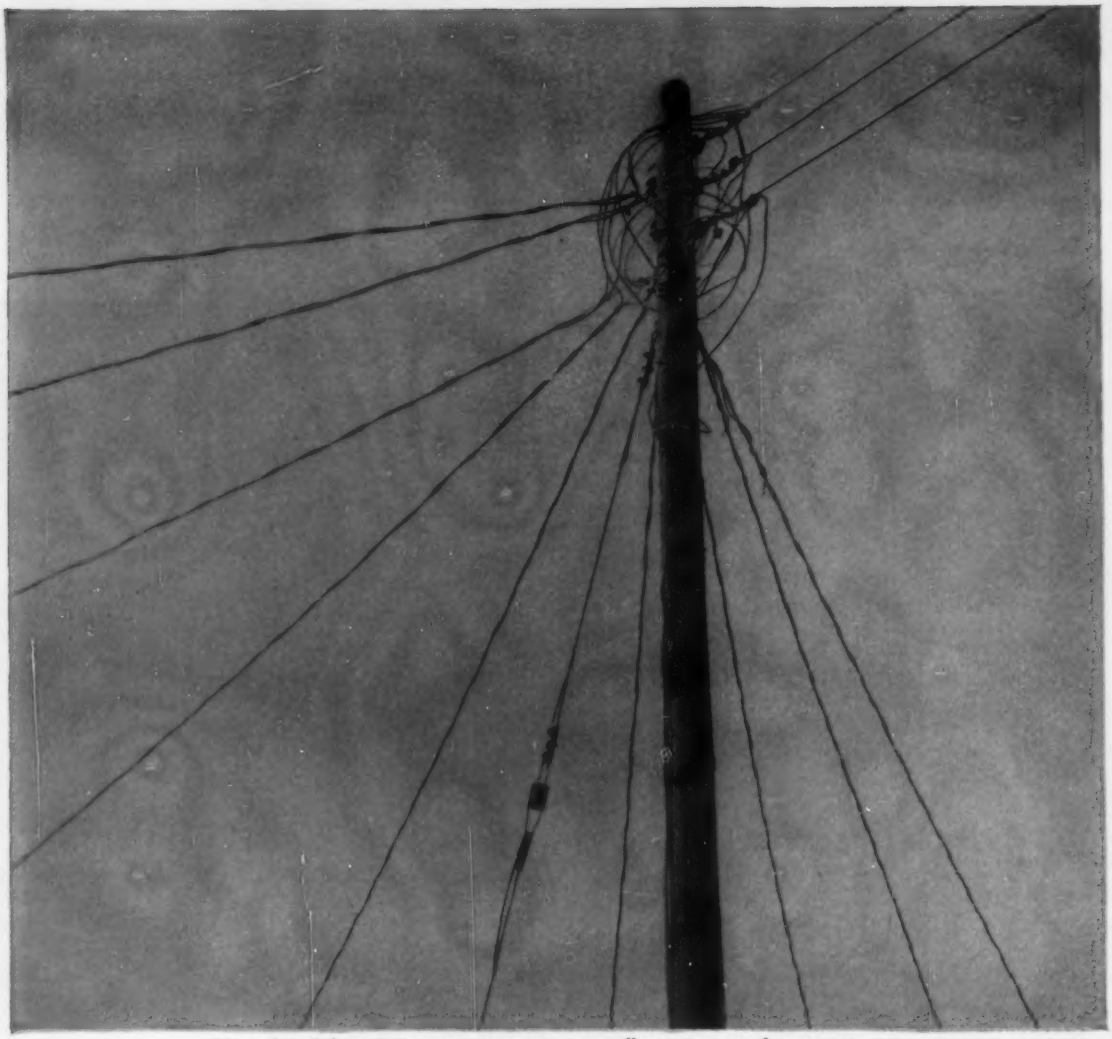
The FWD "Rhino" is the only line truck built *to take* front-end workloads . . . with the driving front axle built 50% stronger than ordinary axles, with the special front spring suspension, and FWD's special alloy steel frame which has a 250% greater bending moment than competitive trucks.

This new Four Wheel Drive unit fits any front-mounted derrick or digger, any approved line body . . . giving you a line truck tailored to your line service requirements.

The FWD "Rhino" is specially designed to fit the rugged demands of utility line work . . . to help you cut down-time and repair costs.

For working economy, get the truck that's built to do many utility jobs faster, cheaper. Let the FWD "Rhino" help keep electric service today's best buy.

CLINTONVILLE, WISCONSIN • *Canadian Factory*, KITCHENER, ONTARIO



This pole in Belton, Mo., carries nine services, yet still retains a neat, clean appearance.

Nine services from a single pole!

Here's the kind of economy you get with Kaiser Aluminum "Triplex" Cable covered with BAKELITE Brand Polyethylene. Nine services—compact and lightweight. Plenty of climbing space for the lineman. Every cable accessible. And all it takes is one pole!

BAKELITE Polyethylene fits right into this economy picture. It's the lightest commercial plastic. Weight saving permits longer spans and use of fewer poles. Outstanding resistance to moisture, sunlight, weathering, and aging are characteristic of this black pigmented compound. It withstands acids, alkalies and most chemicals. Dielectric properties are excellent. Tensile, impact, and flexural strengths are high. BAKELITE Polyethylene pulls and strips easily, yet won't festoon or rot.

To learn more about BAKELITE Polyethylene for wire and cable covering, write Dept. KO-53.

Kaiser Aluminum "Triplex" Cable with BAKELITE Polyethylene jacket is sold by **Kaiser Aluminum & Chemical Sales, Inc.,** Chicago 11, Ill.

BAKELITE BRAND **Polyethylene Plastic**

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

For cost conscious engineers...

Unique adaptability of Sangamo Type R Current Transformer encourages simple, economical installations

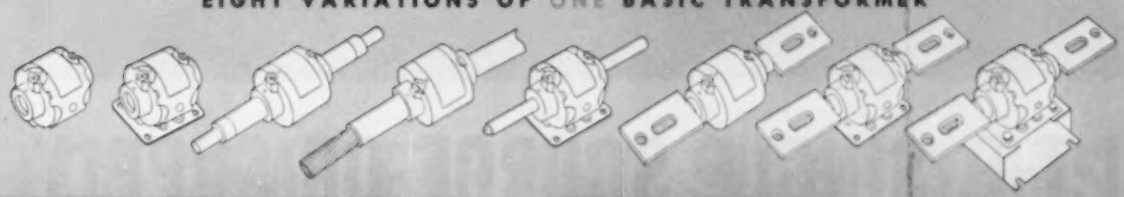
Use this Sangamo (Type R) Current Transformer as a bar-primary-type, a window-type, with or without an auxiliary mounting plate.

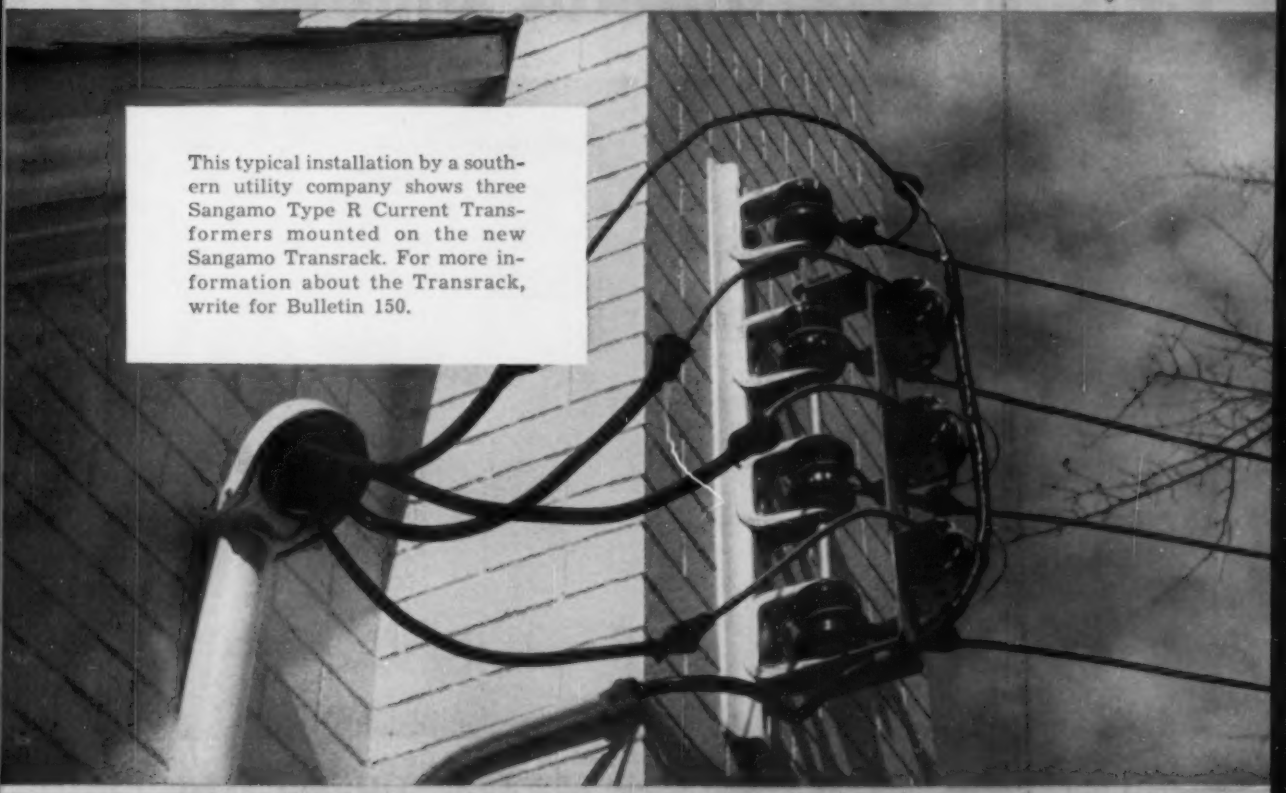
The Type R is light enough to be supported by the primary conductor only.

Type R's are encased in a high impact, phenolic shell, filled with a thermo-setting plastic that eliminates voids and prevents moisture from reaching core or windings.

Full information is given in Bulletin 501... be sure to write for your copy today.

EIGHT VARIATIONS OF ONE BASIC TRANSFORMER

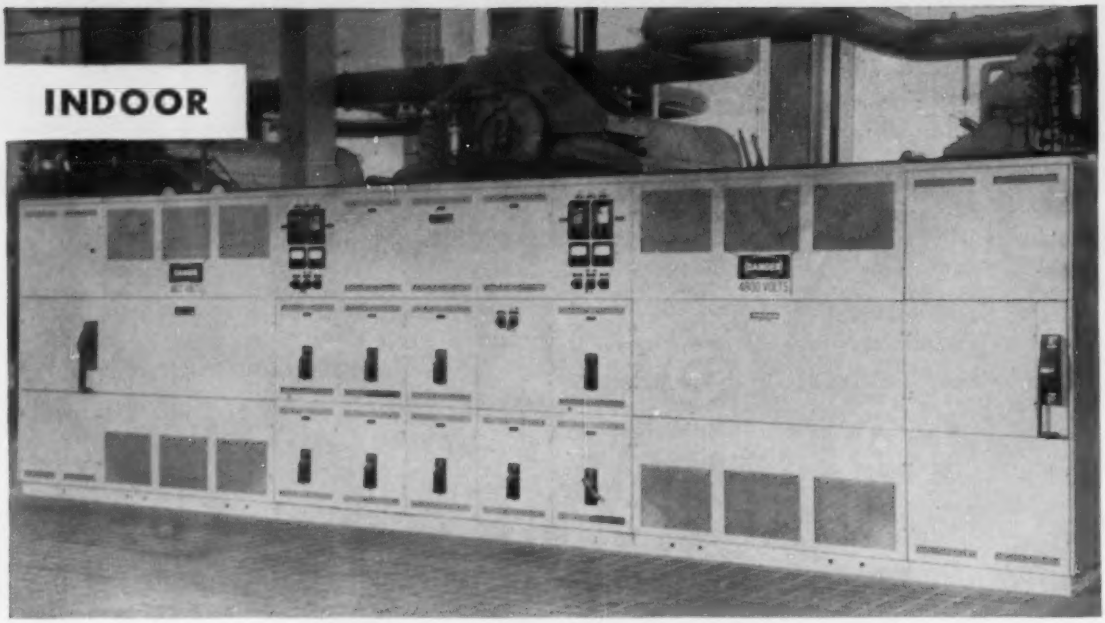




This typical installation by a southern utility company shows three Sangamo Type R Current Transformers mounted on the new Sangamo Transrack. For more information about the Transrack, write for Bulletin 150.

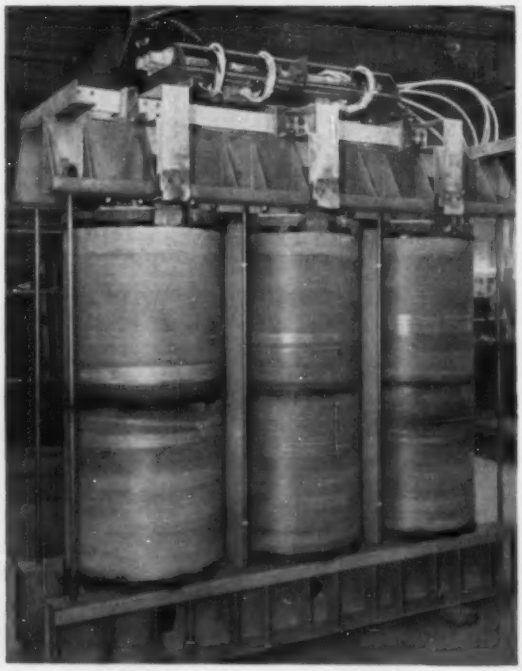
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

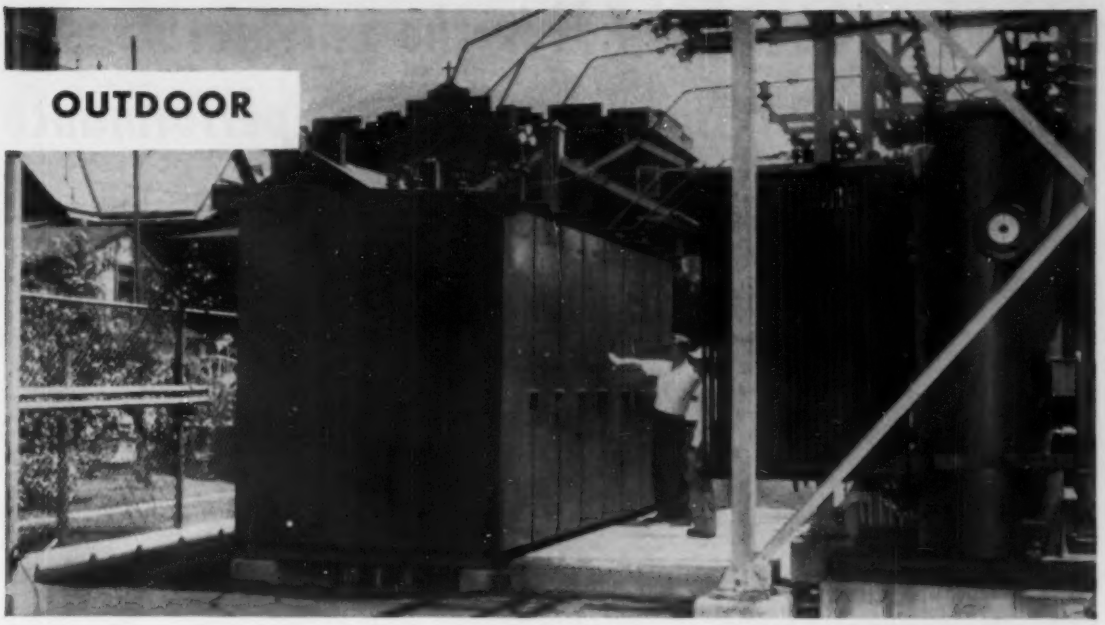


I-T-E, SINGLE SOURCE OF SUPPLY

Primary Section: Maximum protection on the primary side is assured with I-T-E Power Air Circuit Breakers. As an alternate to circuit breakers, roof bushings, throats, terminal chambers, oil cutouts, liquid disconnect switches or air interrupter switches may be furnished.



Transformer Section: I-T-E can supply any type of transformer required for a particular installation. It can be either liquid filled, nitrogen sealed, or dry type. All transformers match and line up with the primary and secondary sections to create one complete unit.



FOR COMPLETE UNIT SUBSTATIONS

Secondary Section: The secondary section consists of I-T-E switchgear. Completely interchangeable, horizontal drawout air circuit breakers are housed in a sturdy structure with completely isolated compartments, large rigidly braced bus, and a superior exterior finish.

You can buy a unit substation either of two ways: a piece at a time (the expensive way), or all at once (the economical way). I-T-E can sell you the individual elements, but recommends that substations be purchased complete, and from a single source of supply.

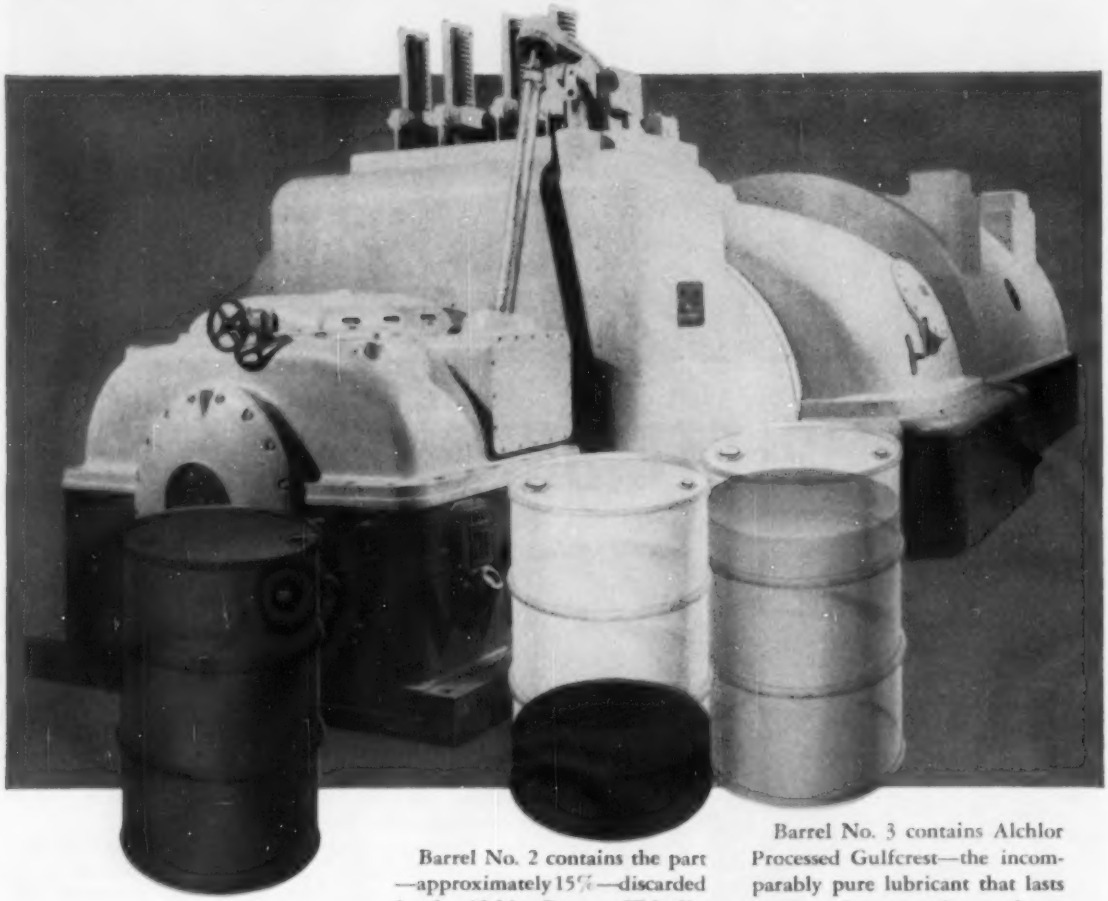
There are good, practical reasons for this. I-T-E's engineering assistance in over-all planning, floor layout, and choice of elements is more valuable to you when it covers the complete substation. Units are packaged and shipped ready to install without delay or complications.

There are further advantages in knowing that one dependable company stands behind your complete installation, and that all parts are designed to function as a unit.

I-T-E Primary and Secondary Unit Substations can be supplied for any application: indoor and outdoor, and in any standard rating. For details, contact the I-T-E sales office nearest you. Look in your classified directory under "Electric Equipment." I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pennsylvania.

I-T-E CIRCUIT BREAKER COMPANY
Switchgear Division

GULFCREST *is the only turbine oil that is super refined for superior performance by the ALCHLOR PROCESS*



Barrel No. 1 contains a highly refined oil that will become Gulfcrest. It has gone through the usual steps used in refining other turbine oils—but has not yet been Alchlor Processed.

Barrel No. 2 contains the part —approximately 15%—discarded by the Alchlor Process. This discarded portion contains unstable hydrocarbons which, if allowed to remain in a turbine oil, are likely to oxidize, increase neutralization number, form sludge, emulsifiers, and harmful acids.

Barrel No. 3 contains Alchlor Processed Gulfcrest—the incomparably pure lubricant that lasts longer, gives superior performance and helps keep your turbine systems clean indefinitely. To make Gulfcrest even finer, special inhibitors are added to give it still greater stability and protect against corrosion and foaming.

Call your nearest Gulf office today and have a Gulf Sales Engineer recommend the proper grade of Gulfcrest Oil to meet the specific requirements of your turbines.

GULF

GULF OIL CORPORATION • GULF REFINING COMPANY • 1822 Gulf Building, Pittsburgh 30, Pa.

MORE KVAR

in less space–at lower cost

33.3

KVAR

Practically the same size! Unit on left is 25 KVAR. Unit on right 33.3 KVAR.

ANOTHER C-D FIRST—new C-D 33.3 KVAR capacitor reduces rack space while retaining mounting features for standard NEMA frames.

Only slightly wider than the conventional 25 KVAR unit, yet the new C-D 33.3 KVAR capacitor provides over 30% additional corrective KVAR.

Only nine C-D 33.3 KVAR units required in place of the customary twelve 25 KVAR units; or twelve C-D 33.3 KVAR units will expand standard pole installations to 400 KVAR.

C-D's new size capacitor meets the utilities' demand for larger CONCENTRATED blocks of reactive KVA.

C-D's new unit results in significant savings on customer's initial installation costs. Space saving feature means fewer poles, fewer cross arms, less cable copper, fewer man hours and a minimum of trucking and warehousing.

C-D's traditional safety factor in effective volts per mil unit stress contributes materially to C-D's exceptional record of 99.6% TROUBLE FREE SERVICE.

'Phone or write to Cornell-Dubilier Electric Corporation, Power-Factor Division, South Plainfield, New Jersey.

CORNELL-DUBILIER CAPACITORS

consistently dependable for power-factor improvement

Plants in So. Plainfield, N. J.: New Bedford, Worcester, Cambridge, Mass.: Providence, Hope Valley, R. I.: Indianapolis, Ind.; Sanford, Fuquay Spring, N. C.: Venice, Calif.; Subsidiaries: Cornell-Dubilier Electric Int'l Corp., N. Y. C., Radiart Corp., Cleveland, Ohio.

NOW– Molded Current Transformer Line Extended to 4000 Amps

Money-saving advantages now available on higher rated units

TYPE BKM for 1200 and 1500-ampere use has opening for primary conductor 4¼" high, 1¾" wide.

TYPE BKM for 2000 and 4000-ampere application has 4¼" square opening for primary conductor

New Additions to Allis-Chalmers service-proved line of molded current transformers are designed for heavy duty metering. Liberal design provides plenty of overcurrent capacity, with no overheating or reduction of accuracy.

- **No Painting Required** because these transformers are cast in thermo-setting resin, which provides high impact strength and excellent weather and fire resistance. Stocking problems are simplified because these units can be used either indoors or outside.
- **Mounting is Simplified.** These transformers can be mounted in any position. If desired, the base can be removed to mount on any convenient flat surface — walls, bars, channels, etc. A removable short-circuiting device and sealable secondary terminal cover are standard. A conduit box can be substituted for the secondary terminal cover.
- **Easy Conversion** to 5000-volt bar-type units will be made with a handy conversion kit, as on previously announced smaller units in the line.

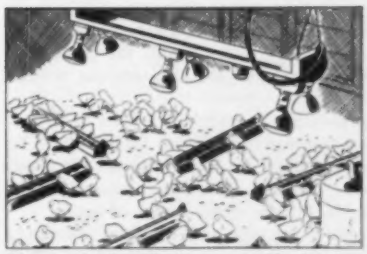
GET INFORMATION on these new transformers by calling your nearby Allis-Chalmers office. Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

ALLIS-CHALMERS

A-4866

Sylvania 250-watt Infrared Brooder Lamp features No. 2 frost, special hard moisture-proof glass, new high-temperature basing cement.

New! High-diffusion brooder lamp saves livestock lives and costs



Battery of 6 brooder lamps provides heating for 750 chicks. Sufficient area allows stock to move in and out of heated zone freely.

Now, for the first time, farmers will start to benefit from this new lighting "first" by Sylvania—an infrared heat lamp designed specifically for brooding purposes.

Here's what's new: Higher-diffusion No. 2 frost virtually eliminates "hot spots"—delivers safer, more even heat with a more diffuse pattern of radiation. Also, exclusive new high-temperature basing cement feature gives additional protection against breakage and falling glass.

In recent years, Sylvania infrared heat lamps have gained more and more popularity as brooders for chicks, lambs and pigs. They deliver the cleanest, quickest, most efficient heat obtainable. Infrared energy is converted to heat only when it reaches a body or object. Little energy is wasted in heating air. And there are no fueling and ash removal problems.

SYLVANIA ELECTRIC PRODUCTS INC.
Dept. 5L-2810—Lighting Division
60 Boston Street, Salem, Mass.

Be sure you have all the latest data on infrared brooding and most effective use of Sylvania's new Infrared Brooder Lamp.

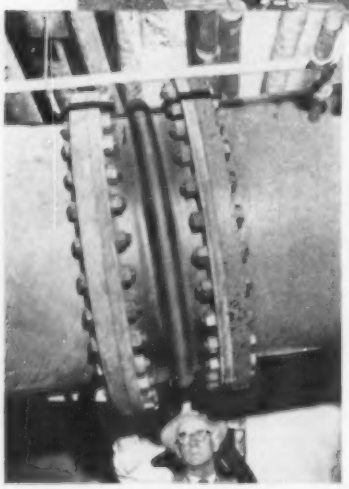
Send for our new illustrated booklet, "Infrared Heat on Your Farm for Brooding."

SYLVANIA®

...fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

KEEPING A CITY'S FEET DRY...



Note great size of this U. S. Expansion Joint installed on a generator in the New Orleans S&WB plant at Eagle and Spruce Streets

for over 26 years U. S. Rubber Expansion Joints have been doing just that!

New Orleans is a city nestled in a saucer. Surrounded on all sides by water, many of its areas are below sea level. Add to this, one of the heaviest rainfalls in the country (as much as 15 inches in 17 hours) and you can see that this glamour city could easily be flooded.

But the New Orleans S&WB* keeps the city's feet dry by means of a pumping system that carries off the rain. Turbo-generators supply the power not only to operate this drainage pumping system but also the separate sewage pumping and the water supply systems.

26 years ago, one of these turbo-generators *(in use 98% of the time)* was equipped with 5 United States Rubber Company Expansion Joints. Why? To allow for contraction and expansion in pipe lines, and to counteract vibration. Says the Chief engineer of the S&WB: *"The U. S. Joints have never failed in all that time.* If any of them ever had, the turbine would be out of use."

U. S. Expansion Joints are widely used in the pipe lines of utility generating plants, municipal water supply systems, office and apartment buildings, ships – wherever pipe lines have to be protected against vibration, contraction and expansion. These joints soon pay for themselves by eliminating expensive maintenance and replacement in pipe lines. They eliminate noise. Once installed, you can count on years of trouble-free service. Obtainable at any of the 27 "U. S." District Sales Offices, or write address below.

*Sewerage and Water Board

"U. S." Research perfects it..."U. S." Production builds it...U. S. Industry depends on it.

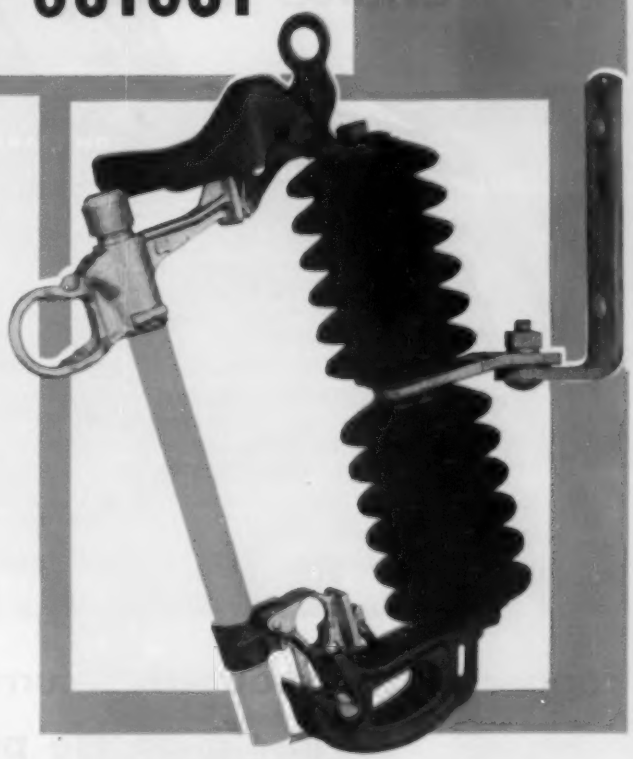
UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

HIGHER INTERRUPTING RATINGS! SAME LOW COST!

SOUTHERN STATES NEW TYPE CV-33-F CUTOUT

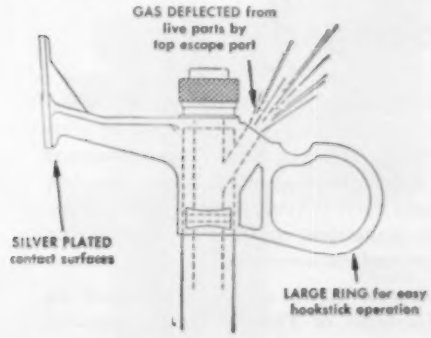


Here is Southern States' answer to stepped up protection for continually increasing system capacities—the new Type CV-33-F control-vented cutout . . . tougher, more versatile than any of its famous predecessors . . . at no increase in price!

Install the Type CV-33-F today with full assurance that it will take in stride the heavier faults sure to come in the years ahead. Build a new margin of safety into your system which will mean substantial savings over the years!

The Type CV-33-F functions dependably in all ranges of cutout operation . . . from restricted faults to those of high magnitude. It is a simple, sturdy unit. Nothing to go wrong or get misplaced. No spare parts necessary to put it back into operation—only a conventional universal button-head link.

Specify Southern States Type CV-33-F Cutouts and get extra protection without extra cost.


GAS DEFLECTED from live parts by top escape port
SILVER PLATED contact surfaces
LARGE RING for easy hookstick operation

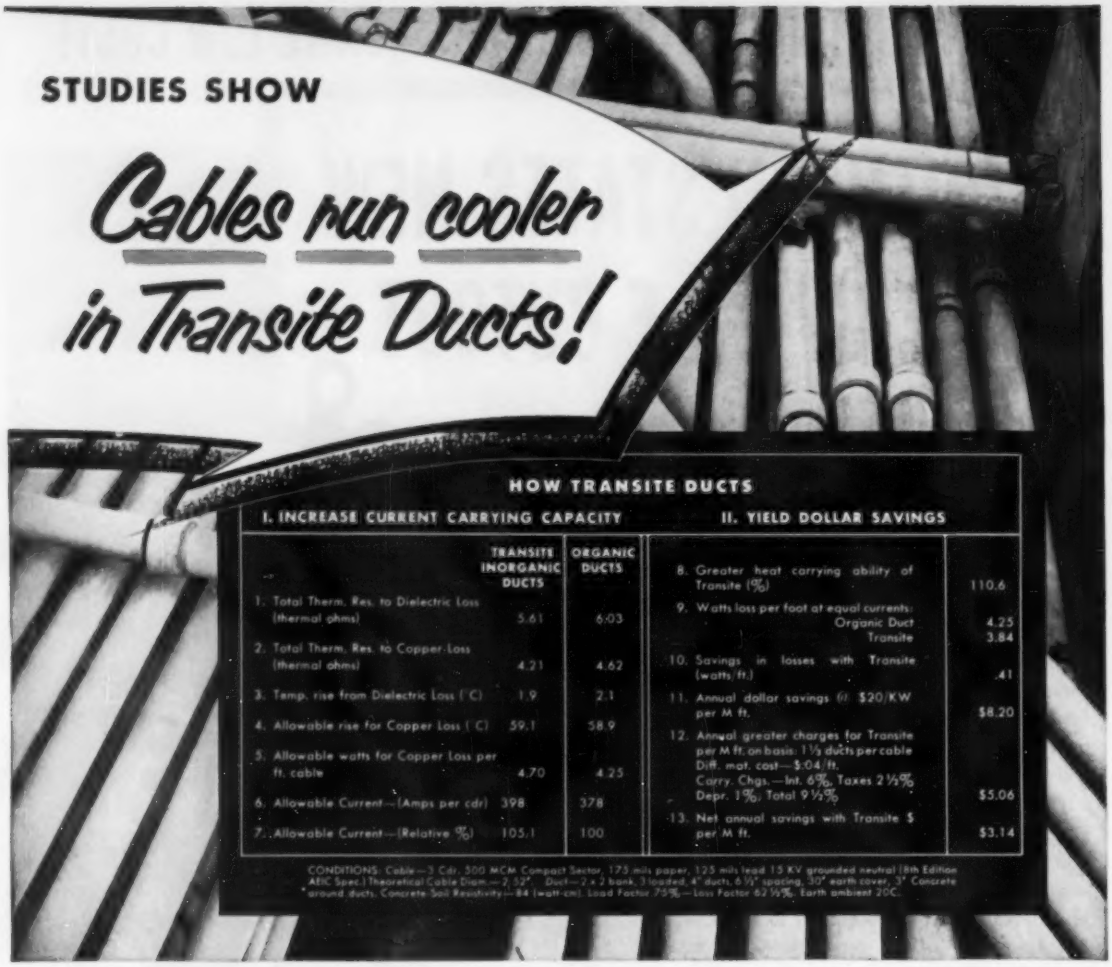
Check These Interrupting Ratings Available at No Increase in Price

TYPE CV-33-F			TYPE CV-33-FH		
KV	CONT. CURRENT	RMS AMPS INT. CAPACITY	KV	CONT. CURRENT	RMS AMPS INT. CAPACITY
5	100	6,000	5	100	8,000
			5	200	8,000
7.5	100	6,000	7.5	100	8,000
			7.5	200	8,000
15	100	4,000	15	100	6,000
25	100	2,000	15	200	6,000

NOTE. ALL STATIONARY CONTACTS ARE RATED 200 AMPS

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto



STUDIES SHOW

Cables run cooler in Transite Ducts!

HOW TRANSITE DUCTS

I. INCREASE CURRENT CARRYING CAPACITY

	TRANSITE INORGANIC DUCTS	ORGANIC DUCTS
1. Total Therm. Res. to Dielectric Loss (thermal ohms)	5.61	6.03
2. Total Therm. Res. to Copper Loss (thermal ohms)	4.21	4.62
3. Temp. rise from Dielectric Loss (°C)	1.9	2.1
4. Allowable rise for Copper Loss (°C)	59.1	58.9
5. Allowable watts for Copper Loss per ft. cable	470	425
6. Allowable Current—(Amps per cdr)	398	378
7. Allowable Current—(Relative %)	105.1	100

II. YIELD DOLLAR SAVINGS

8. Greater heat carrying ability of Transite (%)	110.6
9. Watts loss per foot at equal currents: Organic Duct	4.25
Transite	3.84
10. Savings in losses with Transite (watts/ft.)	.41
11. Annual dollar savings @ $20/KW per M ft.	$8.20
12. Annual greater charges for Transite per M ft. on basis: 1⅓ ducts per cable Diff. mat. cost—$.04/ft. Carry. Chgs.—Int. 6%, Taxes 2⅓% Depr. 1%, Total 9⅓%	$5.06
13. Net annual savings with Transite $ per M ft.	$3.14

CONDITIONS: Cable—3 Cdr. 500 MCM Compact Sector, 175 mils paper, 125 mils lead 15 KV grounded neutral (8th Edition AEIC Spec.) Theoretical Cable Diam.—2.52" Duct—2 x 2 bank, 3 loaded, 4" ducts, 6½" spacing, 30" earth cover, 3" Concrete around ducts. Concrete Soil Resistivity—84 (watt-cm). Load Factor 75%—Loss Factor 62½%. Earth ambient 20C.

copper losses reduced . . . current capacity increased . . . insulation life prolonged

Tests have been made for many years by the Johns-Manville Research Center, to determine how Transite Ducts improve the dissipation of heat by conductors under load. The application of the test results is summarized above.

The figures prove that Transite Ducts will carry heavier current loads than organic ducts when sheath temperatures are the same. The result is a cooler cable under a given load . . . lower I^2R losses . . . longer insulation life from lower operating temperatures.

Transite Ducts offer many other advantages, too. Made of asbestos-cement, they are incombustible, resistant to corrosion, unaffected by electrolysis. When arcing occurs, Transite protects adjacent cables from damage. These durable, light-weight ducts provide complete and permanent cable protection, together with savings on installation and maintenance.

For complete details on these tests and the many advantages of Transite Ducts, write for free copy of Brochure EL-29A. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

JM PRODUCTS

Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

Bulletin No. H307-355

MOLONEY HiperCore

DISTRIBUTION TRANSFORMERS

MOLONEY
HiperCore Transformers are available from stock in all Standard Ratings in both Conventional and CSP designs.

MOLONEY ELECTRIC CO.

SALES OFFICES IN ALL PRINCIPAL CITIES

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

YOU JUST CAN'T BUY A BETTER TRANSFORMER THAN HIPERCORE

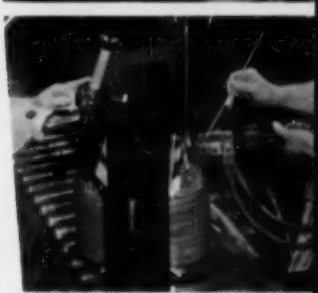
Regardless of cost, you just can't buy better transformers than Moloney HiperCore Distribution Transformers . . . those who are using them know this. Once you try Moloney HiperCore Distribution Transformers you'll know why utility men say . . . "Hang a HiperCore and forget it."

Specify Moloney . . . Dependability at its Best

MOLONEY ELECTRIC COMPANY

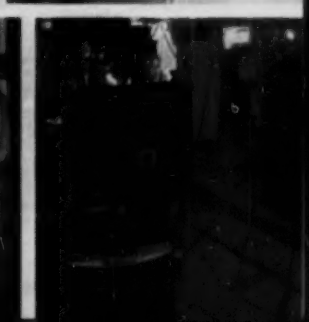
Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers • Capacitors • Magnetic Components for Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES



MOLONEY

HiperCore Transformers are available from stock in all Standard Ratings in both Conventional and CSP designs.

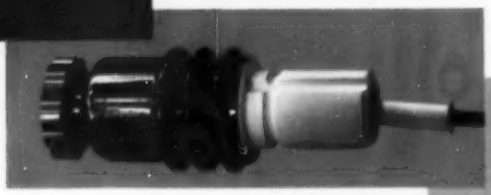


FEATURED FOR BETTER UTILITIES EVERYWHERE

MOLONEY ELECTRIC

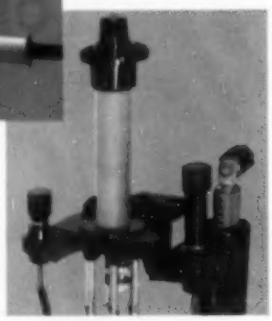
COVERS

Positive seal tank cover retains reusable gasket under pressure. Welded retaining ring returns all splashed oil to main body of tank.



HV BUSHING

High-strength, wet-process porcelain, keyed for safety. Electro-tinned terminals accommodate copper or aluminum conductors.

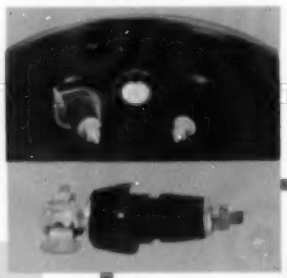


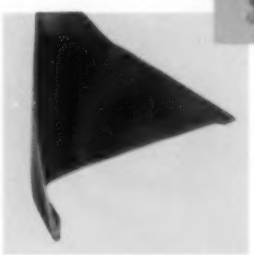
TAP CHANGER

Combination tap changer and high voltage terminal block. Features high pressure contact and positive snap action. Operating handle located above hot oil level.

LV BUSHING

High-strength, wet-process porcelain, keyed for safety. Designed for either above or below vertical takeoff.





TANKS

Rust-resistant, copperbearing steel, resistance welded. Triple thick rolled base.

MOLONEY

HiperCore Transformers are available from stock in all Standard Ratings in both Conventional and CSP designs.

Litho in U.S.A.

MOLONEY ELECTRIC COMPANY

SALES OFFICES IN ALL PRINCIPAL CITIES

EDITORIALS

"The Great . . . Give Away of the Century"

Federal power advocates who would drag the government further in the electric power business have angrily tagged Republican power policy with the "give away" label. Chief among the detractors have been Oregon's Democratic Senators Wayne Morse and Richard Neuberger.

A few weeks ago the sharp-tongued Clarence A. Davis, Under Secretary of the Interior, journeyed to Oregon to rebut the Fair Dealers in their own home territory. A veteran of 29 years practice as a lawyer representing both private and public utilities, Davis answered them:

"Let us talk a little about give aways.

"Are there any 'give aways' involved in their (Fair Dealers') program? For I feel their program is the greatest 'give away' that has been proposed in this generation. They propose to give away from this region the right to control its own economic destiny. They prefer to keep this region and all of its inhabitants standing with hat in hand, asking political favor and pleading for appropriations from an all-powerful government in Washington. They propose to give away a large part of the business opportunities for this region—unless you are friendly with them. They propose to give away the opportunity of the individual to choose his own employment. They expect him to come to them to be employed.

"They plan to give away any chance of the children of the Northwest to be able to develop their own resources, to map out their own destiny, to establish their own homes, and to lead their own lives because they expect to maintain a complete federalization of the electric power, the water, and therefore, indirectly, the land of this region.

"They are actually giving away the plan of government of the United States. They are giving away all of the independence which the pioneers of Oregon sought to establish.

"They are giving them into the control of a Congress of 450 members, of which the State of Oregon has four. They are giving them to the control of a United States Senate of 96 members, of which the State of Oregon has two. They are giving them to an all-powerful bureaucracy composed of people whom you in Oregon can neither vote for, nor can you hire, nor can you fire.

"Their program is truly the great proposed give away of the century."

"He That Loves Reading . . ."

Reading is the most important tool in the performance of our daily job. It brings us the information on which the most vital decisions are made. It provides the means for translating these decisions into action. And as our industry grows larger, the importance of reading is magnified.

Yet few people stop to realize that their chance for advancement may hinge directly on their reading skill and their choice of reading matter. Look around you at the most likely candidates for promotion. You'll most likely find them right up to date on their specialty. They will generally have a broad appreciation for current developments in the industry.

There are numerous ways to acquire such knowledge, but there is no easier, cheaper, more effective way than by reading. Ralph M. Besse, executive vice president of Cleveland Electric Illuminating Co well stated the case for reading in a recent article (EW, Oct. 17, p 112). He devoted an entire half-day monthly meeting of CEI department heads to a discussion of reading. In his discourse he treated the various areas of reading and gave some generally helpful hints. Besse strongly suggests that specialty and trade magazines are a must for the alert executive seeking advancement.

Other utilities, too, are showing an increasing awareness of the importance of the reading skill. Colorado Public Service Co, for instance, offers an up-to-date reading improvement course for its management personnel. It is aimed at quickening the reading pace of this type of personnel.

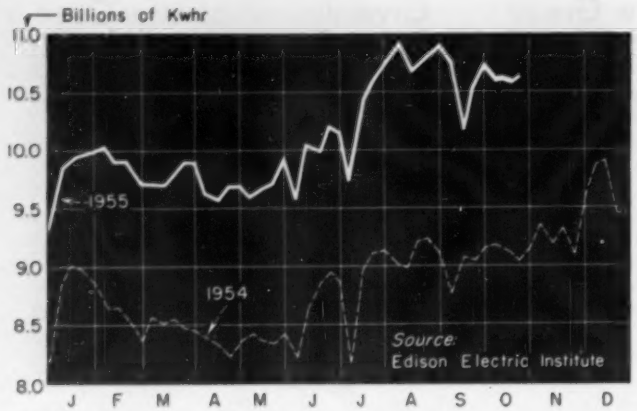
There is no surer sign that electric utilities are on their toes than the attention they are now giving to this basic and fundamental matter of reading.

Buy It and Use It

Brand new 1955 edition of the Edison Electric Institute "Pocketbook of Electric Industry Statistics" is now available and as chock-full of facts as previous editions. In it you will handily find such facts as these:

- Electric utilities in the United States generated approximately 40% of all the electric energy generated in the world during 1954.
- Electric companies had an average plant investment of $82,205 for every operating employee in 1954.
- Electric companies paid an average of 22.8¢ in taxes for every revenue dollar received in 1954.
- U.S. utilities had 51.2 million customers in 1954 of which 40.2 million were served by investor-owned companies, 4.1 million by rural cooperatives, and 6.9 million by government-owned utilities.
- Electric utilities owned 2.7 million circuit miles of overhead line of 22 kv and above at the end of 1953.

You'll find all these and thousands more such facts in this convenient, pocket-sized booklet now available from Edison Electric Institute, 420 Lexington Avenue, New York, 17, N. Y., 35¢ for single copies, 18¢ each in lots of 100 or more.



OUTPUT

Week Ended Oct. 22
10,644,000,000 Kwhr
Up 17.9%

Atomic Energy Commission requirements — 1,033,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 12.5%

Per Cent Change from Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent	Rocky Mount.	Pacific NW	Pacific SW
Oct. 22	+17.9	+12.3	+11.3	+29.7	+9.3	+19.8	+12.3	+22.4	+6.7	+13.5
Oct. 15	+16.3	+11.0	+8.6	+28.6	+6.3	+19.6	+6.7	+23.1	+9.0	+11.6
Oct. 8	+15.7	+11.3	+7.5	+27.4	+7.2	+19.0	+8.8	+23.6	+7.8	+10.7

Seasonally Adjusted Index 205.4 Week Ago 204.2 Year Ago 174.0

Issue's Highlights—Rep Earl Chudoff winds up hearings in Washington with invective for Interior Department, promises more hearings in spring . . . AEIC elects Austin D. Barney, president, and Walter C. Beckjord, vice president . . . Northern States Power, Otter Tail Power, and two North Dakota co-ops give University of Minnesota $100,000 grant to aid research in agricultural applications of atomic energy . . . Bureau of Reclamation invites proposals from private utilities, public agencies for partnership development of $225-million Trinity River Project in California.

NARUC Convention—In Asheville, N. C., last week retiring Pres W. F. Whitney told delegates "Challenging (regulatory) problems are and will be constantly developing. Solution of these problems by regulation will demand men and women alertly watchful, possessing highest degree of character and ability" if regulation is to function fairly or survive permanently . . . General Solicitor Austin L. Roberts contended that every utility user should be interested in Federal highway projects because relocation costs to utility will ultimately be borne by customer . . . Panel discussion on nuclear energy brought forth pleas to examine adequacy of state statutes and proposed regulations and for study to ensure uniform accounting treatment.

Labor—UE-Ind electrical workers last week called national strike at Westinghouse in support of IUE-CIO. Action closed down five more major plants in addition to 20 major plants and ten service shops picketed by strikers. Stoppage now involves 55,000 workers, but half of major plants and two-thirds of service shops are still operating. Meetings between unions and management were continuing in Pittsburgh . . . Threatened strike by CIO employees at Housatonic Public Service (Derby, Conn.) has been averted by agreement between labor and management to accept arbitration.

Con Edison Builds—Board of Trustees last week authorized Con Edison mangement to proceed with planning $69-million, 330,000-kw electric generating unit to be installed at Arthur Kill station on Staten Island. Unit will be duplicate of company's planned Astoria station unit.

Copper—Lowered European price will not mean more Chilean copper for U.S. Chilean government has decided to maintain present sales proportion of 65% to Europe and 35% to U.S. in belief that price drop in Europe is temporary.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire—Albert K. Scheidenhelm becomes executive director of SEC Dec. 1 . . . Interior Secy Douglas McKay told National Reclamation Association at Lincoln, Neb., future hydro projects should be financed with power revenues . . . Rep Earl Chudoff, answering editorial in Washington Post & Times Herald, said exhaustive hearings on marketing of Clark Hill power showed no "illegal or improper action or influence" on part of Georgia Power . . . Alco Products has begun building 2,000-kw Army package nuclear power reactor . . . AEC's reactor hazard evaluation staff has been merged with Division of Civilian Application which licenses civilian reactors.

Rate Matters—Starting Nov. 1, Gulf States Utilities will effect rate reductions totaling $1.3 million a year in Texas and Louisiana . . . Arkansas PSC has postponed until Nov. 10 completion of hearing on Arkansas P&L's request for fuel adjustment clause to pass on to customers some of higher fuel costs . . . Eugene (Ore.) Water & Electric Board is studying its rates with view to reducing some categories.

Mergers and Financial—Pacific P&L stockholders have approved merger of Western Public Service into larger utility. According to Wall Street sources PP&L is looking into possible merger with California Oregon Power . . . City of Tacoma, Wash., has appealed to State Supreme Court in effort to end legal entanglement which prevents city from selling bonds for proposed $137-million hydro project. W. C. Langley & Associates last week won $15 million 3⅜% Long Island Lighting bonds at 100.80; will reoffer at 101.421 to yield 3.30%.

Miscellaneous—Westinghouse has submitted apparent low bid of $16,279,500 among three proposals opened by Memphis Light, Gas & Water Commission for turbine generators for new municipal power plant . . . Wyoming PSC has approved contracts for construction of $3.5-million power plant at Kirk, S. D., by Rushmore G&T Electric Co-op. Rushmore will construct plant and lease it to Black Hills P&L for 40 years. Black Hills will operate plant as integral part of its system in Wyoming and South Dakota.

Adequate Wiring—In two years since Con Edison began its adequate wiring promotion campaign in New York City area, increased wiring business created by public demand has totaled about $50 million, Con Edison spokesmen told local electrical industry leaders last week. In addition to new wiring business, campaign created opportunities for increased appliance sales.

ABOUT PEOPLE IN THE INDUSTRY

Citing need for utilities to develop efficient working forces, C. G. Wright, president, Otter Tail Power, told Area Power Conference there must be full awareness of responsibilities to customers. "This must include a realization that we cannot simply stop at the point where we have supplied our customer with his requirements . . . The customer must be satisfied that the increased service he uses is to his benefit; so our employees must be trained in economic application of our service to the customer's needs."

TVA intends to reduce its functions "to realize a full partnership" of federal and local governments and private groups," according to TVA Chairman Gen Herbert D. Vogel. "There should be paternalism in government, but not maternalism," and time has come, he continued, for people of valley to assume some of responsibilities TVA has shouldered. "We are doing in the Tennessee Valley things that the cities themselves should be doing." He rapped Citizens for TVA, Inc, for their "power and power politics and nothing else."

More News About People page 132

Branch Scores Chudoff's 'Hearing' Tactics

Harllee Branch, president of Georgia Power Co, has made repeated attempts to be heard before the House subcommittee headed by Rep Earl Chudoff (D-Pa.). Recently in Washington the subcommittee, hurling charges at Georgia Power, focused on the Clark Hill Dam controversy (EW, Oct. 24, p 8). Again Branch asked permission to testify. And again he was put off. As a result he issued the following statement:

"I have just learned . . . of the Chudoff committee's decision to deny me and my company the opportunity to testify regarding the false charges and insinuations which have been made against us in the course of the alleged 'hearings' regarding the distribution of power from the Clark Hill project. I am shocked by this high-handed and un-American treatment of my company. . . .

"The public . . . will understand that the statement today that we may be called to testify, perhaps next year, is no fair or satisfactory response to our request for an opportunity to refute the charges which have been made against us while they are still fresh in the public mind. . . ."

Chudoff Ends Probe, More to Come

- **Additional hearings promised for next spring to keep power issue alive**
- **Interior charged with "sabotaging" laws as the Washington sessions close**
- **Aandahl, BPA's Pearl, Reclamation's Nelson deny subcommittee charges**

Promise of more hearings next spring to keep the public-vs-private power question alive as an election issue was made by Chairman Earl Chudoff (D-Pa.) of a house subcommittee probing Administration power policies.

Chudoff's group has just completed the first round of a broad inquiry into all phases of Interior Department's power practices, including its relations with rural electrical cooperatives, marketing of power from federal dams, and its plans for supplying future needs. The investigation was carried on in several major cities, including Washington, and was marked by name-calling and frequent partisan clashes among committee members.

Chudoff Charges

As the Washington hearings wound up, Chudoff threw a barrage of charges at the Interior Department. He declared officials are "sabotaging" the power laws set forth by Congress, that they are "despoiling" natural resources, and "taking the law into their own hands." He insinuated there were clandestine tie-ups between incumbent federal officials and private power companies.

These accusations were denied by Administration officials. Assistant Secretary of Interior Fred G. Aandahl said Chudoff's charges "are without justification by either the facts or the spirit of what is being done."

Bonneville Power Administrator William A. Pearl testified that changes being made in BPA contracts are aimed at preventing preference customers from grabbing each other's power, rather than padding the supplies of private utilities. Boise, Idaho, Regional Reclamation Bureau Director Harold T. Nelson threw the blame on Congress for a threatening shortage of power in his area, and denied Interior was involved in unhealthy deals with utilities.

Chudoff Accused

These witnesses were joined by Republican Committee Member Charles R. Jonas (N.C.), who declared Chudoff's statements were "inspired by political motives." He accused the Democratic chairman of running "an inquisition, not an investigation." Jonas is one of two Republicans who have stayed with the probe for the last two months in an attempt to offset some of the charges hurled during the investigation; the other is ranking Republican Member Clare Hoffman (Mich).

Jonas stated that the investigation was ending on "the same partisan note that characterized its beginning." He said Chudoff has "prejudged" the Eisenhower Administration and that all charges and complaints against its officials had been "accepted at face value" by subcommittee Democrats, with no attempt to verify them or obtain the other side of the story.

During the recent Washington sessions of the Chudoff investigation, the questioning was turned over to Associate Counsel Vance Austin, on leave from his post as executive manager of Colorado cooperatives.

Administration Assaulted

Austin also assaulted the Administration's attempts to work out integration contracts between co-ops and private utilities in the Southwestern Power Administration area. There, SPA is holding 130,000 kw of federal power, earmarked for distribution to co-ops, pending completion of arrangements for receipt by co-ops.

Interior would like to see the co-ops adopt the same method used in disposal of Whitney Dam power. SPA sells Whitney output to Brazos Electric Power Cooperative, which resells it to Texas Power & Light Co.

Since the power represents peaking capacity, not usable by the cooperative in this form, TP&L uses it as a peaking resource in its system, and agrees to sell capacity to the cooperatives with the full amount of energy they need at a price reflecting the advantages the company gets from the

peaking capacity. Provision is made for discontinuance of delivery to the company if the co-op can use the peaking capacity itself in the future.

While trying to work out such arrangements, Interior is also in the process of working up a new rate schedule for SPA. Present rate for power with full service energy is 5.6 mills at a 50% load factor. Inflation, revision of cost allocation procedures, and new low precipitation records caused SPA last year to submit a new rate schedule to the FPC. This requested a new rate of 7.16 mills for power now going at 5.6 mills, and proposed setting up a rate of 7.33 mills for peaking capacity with 150 hours of energy per month.

Activation of lease option-to-purchase contracts has made a new rate study necessary. Although it is too early to be sure what it will be, a preliminary draft of studies will be completed about November. Aandahl estimated the 7.16-mill rate will rise to between 7.5 and 8 mills, and the 7.33-mill rate will hit 9-10 mills.

New SPA Rates Considered

Aandahl pointed out that new SPA rates will be an important factor in negotiations now underway between SPA and southwestern co-ops and that this has made him reluctant to release the 130,000 kw of power available.

His unwillingness to barter away the system's capacity was termed by Democrats on the Chudoff subcommittee an attempt at "shotgun weddings" between cooperatives and private utilities. And at a regional National Rural Electrification Cooperative Association meeting last week, NRECA General Manager Clyde Ellis declared Interior is "bottling up 130,000 kw in SPA in order to bait G&T's into the kind of contracts that Interior wants."

Wright Points Out Problems

SPA Administrator Douglas G. Wright pointed out some of the difficulties being encountered in working out contracts with the G&T's in the SPA area. He said the government, under Congress' direction, will sacrifice its option to buy in these cases, and that this represents an equity for which it should receive some compensation.

In exchange for this equity, he said, SPA would like the G&T's to take over the cost of replacement of equipment, $300,000 to $500,000 a year.

A. D. BARNEY

W. C. BECKJORD

AEIC Elects New Officials

The Association of Edison Illuminating Companies recently elected Austin D. Barney president and Walter C. Beckjord vice president at the organization's annual meeting held at White Sulphur Springs, W. Va.

Barney is board chairman of Hartford Electric Light Co and president of Connecticut Power Co. Associated with Hartford Electric since 1924, he has also served as general counsel, vice president, and president of the utility and was elected president of Connecticut Power in 1950. Barney is a past board chairman of National Association of Electric Companies.

Beckjord has been president of Cincinnati Gas & Electric Co for the past ten years. During his 46-year association with the utility industry he has also served as a vice president for American Light & Traction Co, Boston Consolidated Gas Co, and Columbia Gas & Electric Corp. Beckjord is a former president of American Gas Association.

Full account of the recent AEIC meeting in White Sulphur Springs will appear in the Nov. 7 issue of EW.

PSE&G Will Use New Fuel

. . . known as fluid coke which resembles black sand and is derived from recently developed process for manufacturing gasoline

Fluid coke, a new oil-derived material resembling black sand, will be used for the first time commercially as fuel to generate electricity at Public Service Electric & Gas Co's Essex Generating Station.

The new fuel is made during the manufacture of gasoline in a new refinery process developed by Esso Research & Engineering Co of N. Y.

Public Service has contracted for the total output (about 170 tons a day) from an Esso Standard Oil Co fluid coking unit. The coke will be burned in modern boilers at the utility's Essex Generating Station in place of about 750 barrels per day of heavy fuel oil.

Decision to use the new fuel was based on tests conducted by Public Service on 1,000 tons of fluid coke. Conventional ball grinding mills, conveyors, and boilers were found to work well on the coke.

The process of fluid coking was developed to make gasoline and home-heating oil from heavy tar-like substances left over in conventional refining. It has helped refiners get 10% more gasoline from a barrel of crude oil. The process is called fluid coking because it employs the so-called "fluidized-solids" technique enabling solids to flow in a stream of air and oil vapors in the same way liquids flow.

Although other power companies are studying the use of fluid coke, Public Service is the first company to use the new fuel to generate power on a commercial basis.

Utilities, co-ops give Minnesota U. a joint $100,000 . . .

'Atoms for Agriculture' Grant

A $100,000 "atoms for agriculture" grant was recently awarded to the University of Minnesota by two utilities and two cooperatives. The joint grant, to the university's Institute of Agriculture, will finance research in the application of atomic energy to agriculture.

First $20,000 installation of the five-year endowment is being accepted above by Herman F. Skyberg (center), member of the university's Board of Regents.

Shown presenting the four $5,000 checks from their respective organizations are (l to r) Cyrus G. Wright, president of Otter Tail Power Co, Fergus Falls, Minn.; Carl T. Bremicker, vice president, Northern States Power Co, Minneapolis; Victor M. Edman, president, Minnkota Power Cooperative, Grand Forks, N. D.; and L. Splickan, president, Central Power Electric Cooperative, Minot, N. D.

Richard S. Caldecott, professor of Agronomy and Plant Genetics at the University of Minnesota, spoke at the presentation ending a two-day area power conference at Grand Forks.

"Agricultural institutions," said Caldecott, "could play a major role in determining what types of isotopes tend to accumulate in different agricultural species when they are grown on contaminated soil. By so doing, should it develop that a crop producing area becomes contaminated, or is a potential area for contamination because of the proximity of power reactors or other nuclear devices, the area could be cropped with the species least likely to accumulate radioactive isotopes.

"On the other hand, it is also conceivable that if soils became sufficiently contaminated with specific isotopes which presented a hazard, it might be possible to grow plant species which would concentrate these elements which could then be removed from soil by harvesting vegetation."

BR Invites Partnership on Trinity River Project

The Bureau of Reclamation is seeking proposals for partnership development of the $225-million Trinity River Project's power facilities.

Congress authorized the project last session, but made no decision as to whether it should be a partnership or strictly federal venture. Instead, it ordered the Department of Interior to make a two-year study of the feasibility of partnership.

The Bureau has sent letters to California private utilities and public water agencies requesting proposals for developing the project's 230,000 kw.

Pacific Gas & Electric Co has already submitted a comprehensive plan to build the power facilities and pay for falling water. PG&E estimates it would save the government $40 million. California Water & Power Users Association has discussed formation of a new public power district to purchase power or falling water and provide supplemental steam plants.

NOTES FROM THE NEWS

New reactor design has been submitted to Atomic Energy Commission by Yankee Atomic Electric Corp. The company's first design of a reactor to operate its proposed power plant was turned down by AEC. The New England organization has now changed its plans so that the proposed reactor would be power producer only, rather than a dual-purpose power-plutonium plant.

First gas cooperatives are forming in Idaho. Incorporation papers have been filed in Boise for seven of nine cooperatives which two investment banking firms propose to finance with revenue bonds for natural gas distribution. Immediate purpose in each case is to furnish gas to residential, commercial, and industrial customers "as nearly as possible at cost," with no profit to the co-ops. Plans call for the cities to take over the systems when the debts are retired.

Snake River development planned by Pacific Northwest Power Co (EW, Oct. 3, p 82) encountered opposition recently when the Northwest Public Power Association filed a petition of intervention with the Federal Power Commission. NPPA supports federal development with one high dam in the stretch of the river where Pacific Northwest Power plans to erect two dams, one at the Mountain Sheep site and the other at Pleasant Valley.

Atomic energy exposition, entitled "Man, the Atom, and the Future," opened last week in New York City at Carnegie International Center on the United Nations Plaza. On display are the Atomic Energy Commission's exhibit previously shown at the U. N. conference in Geneva last August and exhibits from the atomic trade fair held recently in Washington, D. C. (EW, Oct. 10, p 8). The show will run through Nov. 3.

CL&P Operates Norwalk Sub Day After Flood

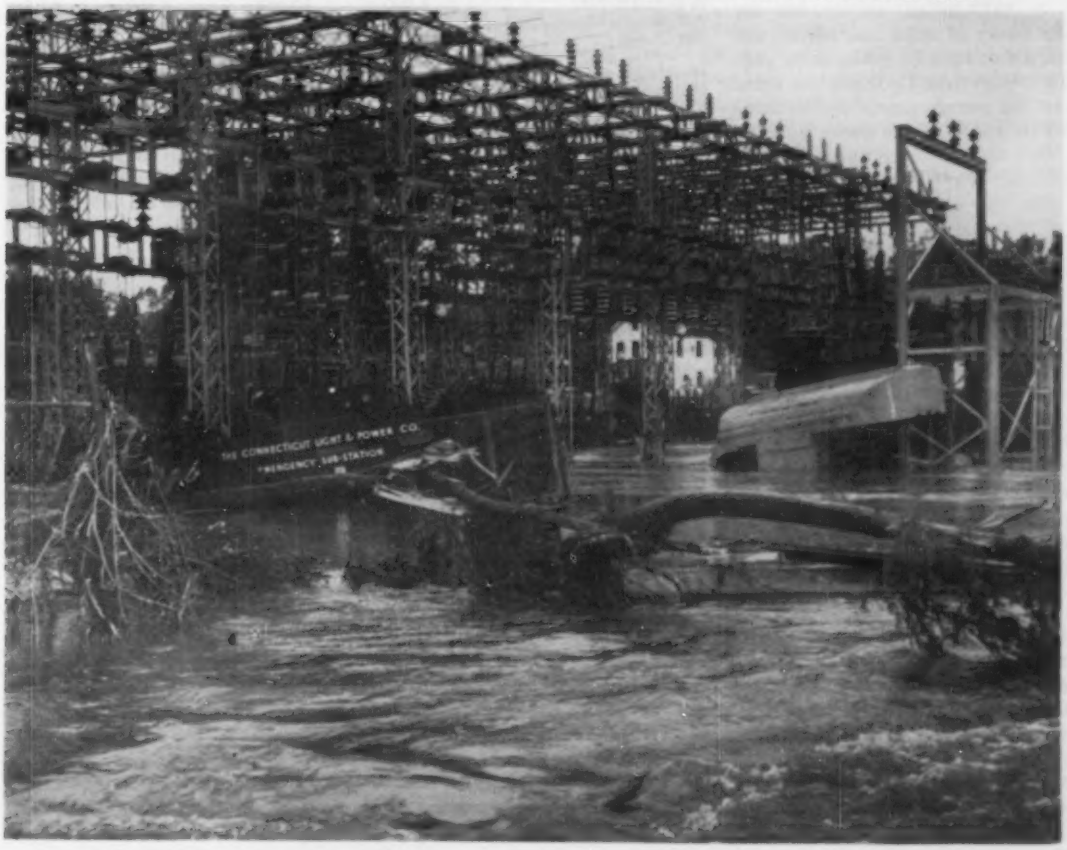
Connecticut Light & Power Co's Norwalk substation was operating within 24 hours after being knocked out by flood waters when recent torrential rains hit the northeastern states (EW, Oct. 24, p 10).

Last week CL&P reported that emergency repairs had permitted partial operation of the substation the day after it had been knocked out of service. Permanent repairs, CL&P states, would continue for several weeks, however.

When the substation was flooded by seven ft of water (see pictures this page), the 4,800-v distribution circuits shorted out with resulting fire. Failure of the substation marked the principal service interruption in the hard-hit southwestern Connecticut area.

AERIAL VIEW OF CP&L'S FLOODED NORWALK SUBSTATION

EMERGENCY EQUIPMENT SWAMPED IN FLOOD WATERS BENEATH THE SUBSTATION'S POWER LINES



Freeholder Unit Approves New Tacoma Light Setup

A proposed new charter for the City of Tacoma, Wash., which would place City Light under a superintendent appointed by the mayor has been approved by a Freeholder Commission elected earlier this year.

The new charter, to become effective, must be approved by the voters at an election which will be held either in December or next spring.

Under the present charter, which has been in effect only a few years, City Light is a part of the Department of Public Utilities, which has a director appointed by a board named by the City Council. The City Light superintendent is appointed by the utilities director.

E. K. Murray, chairman of the Freeholder Commission, sought a charter article which would create an elected public utilities board, but found no support for his proposal.

Nation's TV-Radio Bill

A $650-million electric bill for the luxury of radio and television is handed to John Q. Public every year. This report from TV Digest also stated that the average annual cost of home TV is $13.96, while radio is $2.25.

Changes to Capacity Reported to FPC

PLANT ADDITIONS DURING AUGUST

State	Utility	Plant	Fuel	Capacity
Me.	Central Maine Power Co	Jackman	IC	127
Ill.	Electric Energy, Inc	Joppa	S	156,250
Minn.	Northern States Power Co (Minn.)	Black Dog	S	100,000
Iowa	Forest City Municipal Utilities	Forest City	IC	1,250
Neb.	Crete Municipal Utilities	Crete	IC	1,360
Neb.	Nebraska City Utilities	Nebraska City	IC	2,500
Kans.	Osage City Municipal Light Dept.	Osage City	IC	1,135
N. C.	Virginia Electric Power Co	Roanoke Rapids	H	25,000
N. C.	Duke Power Co	Dan River	S	150,000
S. C.	South Carolina Generating Co	Urquhart	S	100,000
Fla.	Florida Power & Light Co	Cutter	S	100,000
Fla.	Jacksonville Dept. of Electric & Water Utilities	Southside	S	40,000
Fla.	Jacksonville Dept. of Electric & Water Utilities	Talleyrand	S	40,000
Tenn.	Tennessee Valley Authority	Kingston	S	180,000
La.	Franklin Municipal Plant	Franklin	IC	1,400
Okla.	Cherokee Light & Power Dept.	Cherokee	IC	1,250
Tex.	Denton Utilities	Denton	S	12,650
Idaho	U. S. Army Corps of Engineers	Albeni Falls	H	14,200
Ariz.	Arizona Public Service Co	Saguaro	S	100,000
Wash.	U. S. Army Corps of Engineers	Chief Joseph	H	192,000

RETIREMENTS

Mass.	Haverhill Electric Co	Haverhill	S	2,500
Ohio	Dayton Power & Light Co	Frank Tait	S	30,000
Iowa	Forest City Municipal Utilities	Forest City	IC	150
Iowa	Iowa Public Service Co	Correctionville	IC	570
Kans.	Osage City Municipal Light Dept	Osage	IC	227
N. C.	Carolina Power & Light Co	Castle St.	S	6,000
N. C.	Carolina Power & Light Co	Beaufort	IC	600
N. C.	Carolina Power & Light Co	Morehead	IC	1,900

U. S.	Hydro	Steam	IC	Total
Added	231,200	978,900	9,022	1,219,122
Retired	.....	38,500	3,447	41,947
Adjustments Plus	8,200	50,650	8,360	67,210
Adjustments Minus	198	250	264	712
Net Change	239,202	990,800	13,671	1,243,673

H—Hydro, IC—Internal Combustion, S—Steam
United States Capacity as of September 1—Hydro, 24,355,584 kw; Steam, 83,323,077 kw; IC, 2,350,638 kw; Total, 110,029,299 kw.

POWER BRIEFS

• A 900-acre tract was recently purchased by Detroit Edison Co "for future use as a power plant site." Edison President Walker L. Cisler said purchase of the site, about seven miles north of Monroe, Mich., was "part of a long-range program." However, report of the purchase led to renewed speculation on the probable site for the $45-million atomic power plant proposed by Atomic Power Development Associates.

• Statistic-minded U. S. engineers discovered that one of their smaller projects is much larger than the biggest Egyptian pyramid. Lookout Point Dam on Willamette River and its regulating unit, Dexter Dam, contain three times as much material as the largest pyramid. Lookout Point is 630 ft high, while the pyramid is 482 ft.

• In a recent experiment by Bell Telephone Laboratories, an eight-party country telephone line was operated with power from a solar battery. The high cost of purified silicon, however, is said to limit the battery's use to areas where commercial power is not available.

• A one-million-kw hydro project is now under construction in Africa. An expected 10,000 Europeans and Africans will be engaged in building 400-ft high, 1,500-ft long Kariba Gorge Dam on Zambezi River, border of Northern and Southern Rhodesia. The $238-million project of Central African Federation, when completed in 1960, will create a one-million acre lake stretching 250 miles along the river toward Victoria Falls. World Bank financing has been sought.

• A mile-long power line now under construction by Nashville Electric Service will feed $600,000 of electricity every year to Ford Motor Co's $10-million glass manufacturing plant near Nashville.

• A 200,000-kw steam generator is scheduled for 1958 completion at Louisiana Power & Light Co's Sterlington Power Plant. The unit, which will use natural gas or coal for fuel, will boost LP&L's capacity to 675,000 kw.

• A $2.5-million contract for design and construction of a 113,000-kw turbine generator for Pennsylvania Power Co has been awarded to Westinghouse Electric Corp. The unit is scheduled for delivery to New Castle Power Plant Aug., 1957.

McAFEE: POLICY NEEDED

DAVIS: DEVELOPMENT SLOW

SCHILLING: SITUATION DEPLORED

Iowa Utilities to Spend $50 Million

State, national, and atomic power problems are discussed at Iowa Utilities Association annual meeting. McAfee calls for a policy to win wide support

Eight major utilities in Iowa will spend some $50 million in the next 12 months for capital additions, M. L. Kapp, president, Interstate Power Co, told the recent annual meeting of the Iowa Utilities Association at Des Moines.

Kapp spoke as a member of a five-man panel of utility presidents on the general subject, "Our Industry's Forecast." Five hundred utility executives from Iowa and nearby states attending the two-day conclave also heard J. W. McAfee, president, Union Electric Co, discuss problems facing the industry, and W. Kenneth Davis, reactor development director of Atomic Energy Commission, discuss the outlook for nuclear power.

Major portion of the program, however, was devoted to affairs directly affecting utilities in the state, their problems, and accomplishments.

Iowa Deprived of Federal Power

In the opening address J. T. Schilling, executive vice president of Iowa Power & Light Co and president of the Association, deplored the situation which permits all federal power in the area to be turned over to the public power state of Nebraska. Schilling described it as "the biggest give-away scheme to attract people to nationalized power of anything ever done." To counteract its effects he called upon the public to recognize the dependence of the "whole community" upon the service rendered by utilities and remember that ample power and good service is a continuing responsibility.

Size of the Iowa utility construction program—$50 million during the next year—was disclosed by Kapp during a panel discussion in which the following utility presidents also participated: C. H. Whitmore, Iowa-Illinois Gas & Electric Co; N. Bernard Gussett, Iowa Power & Light Co; Edward L. Shutts, Iowa Southern Utilities Co; and G. A. Neal, Iowa Public Service Co.

To help carry out this vast program Kapp called on all management men to help provide the favorable climate required for the financing operation.

Neal emphasized the desirability of having all employees own stock in their respective companies. Whitmore spoke of the need for an understanding utility commission in the regulatory process and the role of such commissions in getting justice for utilities. Iowa has no state commission, but several municipalities exercise regulatory power.

Gussett pointed out that Iowa has a dependable supply of coal so that atomic fuels cannot presently compete in cost. However, he said, in the performance of long range obligations to stockholders, employees, and customers utilities must keep abreast of nuclear developments.

Shutts stressed the need for developing greater company loyalty. Improved internal communications would help. He urged training in communications for all management personnel.

Companies Stress Development

"Utilities Role in Community and Industrial Development" was discussed by a panel consisting of Harry R. Scott, Union Electric Co of Missouri; K. L. Meyer, Interstate Power Co; H. L. Crittenden, Iowa Power & Light Co, and G. A. Uhlmeyer, Iowa-Illinois Gas and Electric Co. The panel brought out these points:

- One company has developed prospectuses of all available industrial sites and assembled information on existing manufacturing, commercial, and warehouse facilities for use in its industrial development program.
- Industrial and community development programs should not be used as a crutch to aid lagging public relations programs but should be carried out in communities

where the utility already has gained public confidence.

• Utilities should provide and exchange all information possible as a part of community development programs.

One highlight of the meeting came in a broad-gauge discussion of "Problems Facing Utilities" by Union Electric Pres McAfee. There is a vital need, said McAfee, to put down on paper a policy statement that a majority of the industry will support. "Perhaps there are some things, where we cannot win, that should not be fought but supported in the most acceptable form."

To reach a decision along these lines, McAfee suggests that management place less emphasis on the daily problems. Instead it should go deeper and expend more cooperative effort on the long range problems of the industry.

The nature of the utility enterprise deprives it of some of the pressures of other industries. This, said McAfee, makes it extremely difficult to get men to use their talents in the most effective and economical way. There is a need, he suggests, to find a substitute for having "someone breathing down one's neck."

Referring to the prospects of economical nuclear power, McAfee said the industry must have confidence that men will someday possess the ingenuity to accomplish this feat. Regardless, he concluded, the industry must go ahead in this field because the public expects the utilities to either carry the load or step aside in favor of the federal government. The industry can't afford to do this.

Reactor Expert W. Kenneth Davis of AEC cautioned against impatience in development of economical nuclear power. Even with the "telescoping and overlapping" of various phases of development, he said, it still requires five to seven years to gain any significant operating results from a reactor power plant. He offered this timetable for nuclear power development which he described as consistent with AEC and company schedules:

Component development and testing	1 to 3 years
Engineering design	1 year
Construction	2 to 3 years
Testing and initial operation	½ to 1 year
Significant operation	1 to 3 years

"The plain fact is," said Davis, "that today we do not know how to do many of the things required for economically competitive power in the United States. We have no shortage of ideas among scientists and engineers on solving the problems. They can predict what the situation will be like if the problems are solved but that does not save them the time-consuming task of actually solving the problems."

Davis disclosed that the AEC plans to move forward in the near future with construction of a small experimental liquid metals fuel reactor.

What Will Your Future Money Cost?

Should electric utilities sell "new money" securities now or await better prices? That's more than a $64,000 question.

The gain or loss from the right or wrong decision could amount to far more than that figure. For instance, a change in yield of only one-twentieth of one percent (.05%) per annum would comprise a gain or loss before taxes of $75,000 on a $5-million 30-year first mortgage bond issue.

The foregoing question leads to many others. For instance: When will the company need the new funds, and what will be the net loss in carrying the securities until the money is needed? Most important of all, what are the prospects for higher or lower interest or dividend rates over the predictable future? Crystal-gazing years ahead is a doubtful science, but in a shorter range the chance for accurate prediction increases.

Factors to Examine

Let's take up the last and most important question first. Prospective high levels of general business indicate a continued demand for funds, trending toward higher interest rates.

Then there is the factor of federal government policy and its impact on money costs. Rates for practically all forms of short term funds have been rising for months past, and the odds seem to favor a continuation of the trend. Treasury bills recently sold at the highest rate in two and a half years; the rate on various kinds of commercial paper has been climbing slowly but steadily.

More important to utilities was the recent increase in the interest rate for prime commercial loans from 3¼% to 3½%, highest in 25 years. But these money costs are temporary while rates for long-term securities have to be lived with for many years.

Extent of Bond Yield Rise

The rise in bond yields for long-term securities which has been going on since the turn of the year seems to have come to a temporary standstill. First grade utility bond yields, according to Reis & Chandler, Inc, rose from 2.89% at Dec. 31, 1954 to 3.11% at Sept. 30, an increase of .22% per annum or 7%. At June 30 this average yield stood at 3.03%.

Second and third grade utility bonds have moved largely in unison. On the other hand the Wall Street Journal's compilation of 11 recent utility bond offerings showed (Oct. 11) that the average bid prices were slightly above the average original offering prices, indicating a net average drop in yield of about .035% per annum.

'New Money' Offerings Drop

Reis & Chandler, Inc, survey for the first nine months of 1955 indicates total electric utility "new money" security offerings of about 62% of the amount sold in the same period of 1954. Total financing for the industry amounted to $998,178,000 for the nine months ended Sept. 30, 1955, as compared with $1,846,769,000 for the same period of 1954. Of this amount "new money" financing amounted to $869,815,000 in 1955 as against $1,395,267,000 for the like 1954 period.

Another straw in the wind is the index of home building contracts which for the first time in a long while showed a 6% drop for September 1955, compared with that month in 1954. If continued, this trend should result in a lessening of demand for mortgage money for home building, thus releasing institutional

(*Continued on page* 146)

THE JUDGES AND THE ENTRIES: Howard W. Mateer, left, publisher, "Electrical Merchandising;" Fischer Black, publisher and editor, "Electrical World;" C. W. Leihy, now editor, "Electrical West." Standing is GE's G. T. Bogard who directed contest. A total 500 lb of scrapbooks were entered by some 48 merchandising and non-merchandising utilities

From 48 Sales Contest Entries Come . . .

9 Ways You Can Build Load

SALES
Residential

With the squeeze on promotion budgets, utilities more than ever need programs that won't miss. Here are some with proven results

"Even if we don't win, just by putting all this stuff together we're getting a much-needed look at what we're doing and not doing in our sales program."

This was one utility executive's comment last summer as he got his entry ready for General Electric Co's "On to Europe" sales contest (EW, Oct. 25, 1954, p 55). It was typical of many.

Last month, after the judging, ELECTRICAL WORLD went through the stacks upon stacks of these entries—lavish scrapbooks, most of them, crammed with pictures, advertising proofs, and sales results.

Kansas Power & Light Co and Washington Water Power Co were named winners. But it was the whole field of entries that was most eye-opening.

They're a gold mine of load building ideas.

Some told of good, solid work-a-day programs that pull steady results. Others described short-term activities, tinged with the spectacular, that delivered equally spectacular sales.

Sales Trends

They indicated some trends too. Turning up with more than casual regularity were these items:

- Comprehensive sales programs with architects and merchant builders.
- Wiring allowances (ranging from $10 to $45) for ranges and water heaters.
- Campaigns tied to Edison Electric Institute's coordinated programs calendar.
- Electric range placement and replacement in high school and college home economic classes.
- Promotion of quick recovery water heaters.
- Use of testimonials in range and water heater advertising.
- Wiring finance plans.
- Promotion of electric space heating.

Many of the selling ideas presented displayed horse-sense ingenuity. Wisconsin Public Service Corp, for instance, waits until 4 P.M. to toss a neighborhood lawn party. Economists show up with the food just about the time the menfolk are returning home from work. Mothers, fathers, kids, and dogs from the neighborhood around get in on the free eats taken from a home freezer and cooked on an electric range. It turns the demonstration into a real family affair, and sales figures show it is well worth the trouble.

At Arkansas Power & Light Co they auction off the appliances following a demonstration—a smart move from three angles: (1) The company usually gets back its investment, (2) A new appliance is added to its lines, (3) It saves hauling it back to the store.

Sales Knowhow

Throughout the entries, a solid savvy of the sales function and its techniques is exhibited. Witness the splendid researching of their markets by such companies as Union Electric of Missouri, Cleveland Electric Illuminating, and Detroit Edison. Witness Kansas Gas & Electric Co which added 483 kwhr per residential customer in one 12 month period—twice the national average. Witness Florida Power Corp which sold 3,939 quick recovery water heaters in three months —58% over quota and 136% more than in the same period the previous year. And witness neighboring Florida Power & Light Co which went 280% above quota in another water heating activity. There are these and more.

On the next seven pages ELECTRICAL WORLD offers in detail, nine load building ideas taken from the contest. They are not overall sales programs, but simply specific activities or policies that had one thing in common—they worked.

WAY NO. 1—Rent as Well as Sell

Kansas P&L Adds 1½ Carloads of Ranges to Lines Every 30 days with $2.94 Rental Plan

One and a half carloads of ranges a month means load. That's what Kansas Power & Light Co has been adding to its lines every 30 days since last October. How? By means of a unique range rental program.

In the nine month period ended June 30, dealers in the KP&L territory sold 2,869 ranges compared with 2,100 in the same previous period—a solid 37% increase. And added to this the company itself placed 995 units.

Says Lee Nicholson, KP&L's director of new business: "It is a realistic program getting the equipment in use on a trial basis so the dealers can reap the benefits from the most powerful of all advertising tools—Word of Mouth Advertising. It not only rents ranges but also opens new markets to create more sales."

Here's how the program operates:

1. Any KP&L customer can rent a modern electric range for $2.94 a month, added to each month's electric bill.

2. All rental ranges are stripped down models, non-automatic and no trimming, to permit maximum sell up possibilities. The range is wired in by the company and remains its property until the customer chooses to "convert" or buy it.

Now!
you can rent an electric range!
Here's your chance to try electric cooking. KPL now has a Range Rental Plan whereby you can rent a modern electric range for only $2.94 a month. See for yourself that electric cooking is best. Stop by or call your nearest KPL office now!
FOR ONLY $2.94 PER MONTH

NEWSPAPER ADS like this invite readers to call at nearest Kansas Power & Light office for details on range rentals

3. The customer may rent as long as he wishes; however at anytime during the first 18 months he may elect to take one of three options: buy the leased range, buy another from the company, or buy one from any of the company's cooperating appliance dealers.

In taking any one of the three options, he is allowed $1.50 per month of his past rental payments towards the purchase price. He also may purchase the range wiring for no more than $20.

Advantages are many, says Nicholson. A few:

• Option No. 3 gives the dealer a chance to work a pre-sold list of prospects. The company finds, however, that the dealers aren't taking full advantage of the opportunity. Only 2% of the rentals converted to sales are made by dealers. But it does serve one big purpose: Dealer is included in program; so he is in no position to object to it.

• More than 39% of the rental ranges go into homes previously using less than 100 kwhr per month. It provides the vehicle on which the range can invade the minimum user market.

• It has supplied company sales people with conversion prospects that are being turned into sales at a rate of about 65 per month. KP&L expects this will soon increase to 100 ranges.

• It gets electric cooking revenue from people living in rental property. Sixteen per cent of rentals have been to servicemen and similar transients. These people don't want to invest money in a range, but the company finds that once a range is in a rental home, it stays. It is just a matter of paper work to transfer the range to a new tenant, and the utility gains cooking revenue it could get in no other way.

• A rental range puts 100-amp, 220-v service into a home. It not only sells electric cooking but breaks the bottleneck for the sale of clothes dryers, and water heaters.

Rentals Pay Off Cost

The $2.94-rental charge, declares Nicholson, will pay off the entire cost of the range, installation, cost of money, taxes, service, and handling in six years.

"In other words," he explains, "if a customer rents the range continually, we obtain the revenue from the sale of energy for six years and completely write off our cost."

Continues Nicholson: "Although a straight continuous rental would be profitable, we have incorporated an incentive to convert their rental contract to a sale in 18 months because we needed a method of controlling our capital investment in rental stock. With the 18-month deadline plus the $1.50 month credit accural we can very easily liquidate the investment using a little sales technique. By converting the range we obtain the revenue from the usage of the electric range during the rental period plus $1.44 rental revenue, plus almost full markup on the equipment itself. We recover all our costs, make a profit, and have a new range user."

WAY NO. 2—Publicize Your Prospects

Chattanooga Puts Home Ec Classes on TV

What has more appeal to a television viewer than seeing his own child perform?

Electric Power Board of Chattanooga finds it is sure fire. Once each week while schools are in session, the Power Board invites home economics classes from 15 local junior and senior high schools to produce a full 15-min TV show with radio simulcast on its regularly sponsored Dure Smith "Party Line" program. The kids do everything from discussing baby sitters' common problems and how to wash synthetic fabrics to demonstrating how a cake should be baked.

To set up the program, Power Board representatives met with teacher representatives, city and county school superintendents, and the Home Economics Association. Television station personnel were on hand with technical advice. The board explained the purpose of the program emphasizing that it would in no way interfere but would lend the assistance of its home economist to teachers requesting it.

"The response was enthusiatic," says a Power Board spokesman, "and it is mounting as the shows continue. TV sets were placed in some of the schools, and we plan to assure every participating school a set this year so their classes can see what other home ec classes are doing. Teachers and students have been most cooperative and eager to participate."

The Power Board's net from all this: good public relations, new student and public interest in home economics, and a new crop of future homemakers pre-sold on electric living.

WAY NO. 3—Entice Salesmen with Sure-Win Contests

Appalachian Spreads Prizes, Pulls Sales

Dealer incentive plans come and go with dealer salesmen seemingly caring less with each passing contest. But Appalachian Electric Power Co came up with a water heater campaign last spring (Feb. 1 to May 31) that had some proven interest-getting twists.

Wanting to boost its water heater sales 25% in a four-month period, Appalachian combined straight incentive with an element of chance in a "Big Payoff" plan that spread generous cash prizes over a wide field.

"Qualified" salesmen who sold and reported a minimum of two water heaters during the campaign were invited to division award dinners where they were given a $10 cash bonus. Those who sold three or more received $25 savings bonds.

That was the starter. Then the top 20 salesmen from each of the company's four divisions were awarded a two-day expense paid trip to a mountain resort and a chance at a $2,525 "Big Payoff" jackpot. As a consolation, five others whose names were drawn from the remaining salesmen in each division also got in on the trip. Thus 25 men from each division, 100 in all, received the trip and a crack at the jackpot.

The jackpot contained the salesman's name once for each sale he made during the contest period. The more sales he made, the better chance he had to win.

Winner on the first draw received a $1,000 savings bond; the second, $500. The third and fourth draws paid $100; the next three, $50; and the eighth, ninth, and tenth, $25. The next 30 draws were for $10 and the remaining 60 for $5. Thus there were 100 salesmen and 100 winners.

But did it sell water heaters? Appalachian reports a four-month campaign total of 5,575 units sold compared with 3,299 in the same period the year before, a gain well-over the hoped for 25%.

Since then, 1,548 salesmen signed up for a similar four-month contest (trips to New York for top producers) and moved 5,978 water heaters.

THESE TOP WATER HEATER SALESMEN (and woman) got lion's share of "Big Payoff" drawing. But others got prizes too. There were 100 salesmen, 100 winners

WAY NO. 4—Help Farmer to Buy

Cash Coupons Up Major Appliance Sales, Boost Montana Power's Rural Net

To return the company a net of 6% on its rural investment, Montana Power Co faced a real marketing problem. It found it would have to boost annual residential rural revenues from an average $82.40 to $100 per customer (21.4%).

To do it, the company decided to concentrate on the farm home with the promotion of water heaters, ranges, freezers, dryers, and water systems. But being a non-merchandising utility, it had to devise a program that would do two things: Send dealers to farmers, and send farmers to dealers.

There was another problem, too: geography. Some 12,827 rural residential customers radiated in all directions from 181 communities over an area larger than all of New England and half of New York combined. With limited company personnel, the company realized quickly it would need the help of all its industry allies.

After some study the company set its course of action. It would give actual financial help to its eligible rural customers (those living on farms and in rural villages) in the purchase of any or all of five electric devices which they did not own. These appliances and the sums the company would provide included: electric range, $25; electric water heater, $25; home freezer, $10; clothes dryer, $10; electric water system, $10. This meant a total of $80 for each customer.

A letter from the division manager announcing the program went out to the rural customers. It told them that a company man soon would make a call.

Coupons worth these cash values were printed, and company representatives then set out for the farmlands. On each call the salesman gave a "pitch" for each appliance and left coupons for those the customer did not have.

In meetings with the trade, distributors were encouraged to make direct mailings to the company's customers. The company furnished the mailing stickers. Dealers were asked to run ads plugging their products and urging the reader to come in and cash his coupons. Montana Power backed their promotion with periodic ads of its own in 50 weekly newspapers.

No Replacements Allowed

To get his cash help, the customer either had to buy an appliance he did not have or an additional one. The purchaser had to endorse the coupon to the dealer at the time of the purchase. The coupon was then redeemed at full face value by Montana Power.

What came of this ambitious move to build rural load? Seventy-five carloads of the campaign appliances—5,072 units were purchased in two campaigns. One ran seven months in 1953, the other nine months in 1954-55. Total dollar volume for the two reached $1,198,618. Except for two towns in the company system, the campaigns were run against gas competition from another company, although there were some areas where gas was not available.

Reaching Objective

In evaluating the results, the company feels it is well on the way towards achieving its objectives.

Says D. J. McGonigle, Montana Power's general sales manager: "These campaigns played a major role in raising rural residential consumption from an annual average of 4,208 kwhr in April 1953 to 5,148 kwhr in June 1955. Revenue-wise they increased the average rural residential bill from $82.40 to $94.75. We estimate conservatively that this figure will rise to $102.20 by December 1956, thus bettering the $100 goal we set at the beginning of the campaigns."

WAY NO. 5—Use Showmanship

Get in the Swim!

When you can entice 16,000 people to come down to your office to get a demonstration, you're doing pretty well. That's what Cincinnati Gas & Electric Co does with super-showmanship plus strong help from newspapers and dealers. Here Miriam Stevenson, Miss Universe of 1955, takes part in "Get in the Swim" fan and air conditioner promotion. CG&E put a real swimming pool in lobby, stocked it with native Ohio game fish. Customers "got in swim" by bringing in signed coupons clipped from cooperating newspaper. Coupons were placed in vials and tossed into letters of word "swim" floating on pool. Names were drawn each day, a fan and thermos jug awarded to winners. Grand prize drawings for air conditioner and two fans were held at end of campaign.

Oklahoma PS Pays Employees to Sell; They Do— 4,484 Appliances in 9 Months

ENGINEER TURNS SALESMAN—This engineering department employee demonstrates built-in range to "tip slip" prospects. If it leads to a sale, he gets $5

Turning employees into salesmen for appliances is nothing new. But at Public Service Co of Oklahoma, the idea is working so successfully that employee salesmanship has become the backbone of the company's entire promotional program.

It's easy to see why after a look at these figures:

- In just the nine months 1,169 different employees (63% of the total working force) turned up prospects.
- Dealers reported 4,484 sales, including 2,495 ranges, were made from these and holdover tips furnished by employees. Some 89% of them made one or more sales.

How does Public Service get this kind of employee response? It pays for it. For every "tip slip" an employee turns in which, having been verified by the area sales manager and turned over to a dealer, results in an actual sale, he receives a $5 bonus. The sale, however, must be of a water heater, range, home freezer, clothes dryer, or window sill reverse cycle air conditioner. In addition, an area "bonus pot," to be divided among those who have created sales is accumulated at the rate of 0.8 mills per kwhr of "per customer" sales gain made during the year.

This participation sales program is based upon the same principles that many companies use in their employee information programs. It embraces a complete-disclosure and discussion of the company's needs and problems.

"Family Conferences" are Key

Three times a year "family conferences" are held in each of the utility's areas. On conference days employees get off work at noon and come back to start the conference at four. Each conference continues until 8 PM including a dinner period. All company matters are discussed with one meeting devoted entirely to sales.

Each employee and members of his family are encouraged to become parttime salesmen. This is directed at the group and not at individual employees. The element of coercion is entirely absent. There are no companywide contests. The employee may elect—and most of them do—to join one of the area contest teams which are formed by employees themselves and in which prizes are decided by the participants.

Company Lends Encouragement

Employees use a variety of methods to develop their "tip slip" leads, and the company is quick to give them help. Samples:

- Believing strongly in demonstration selling, it supports a "purchase-use-demonstration" program to help the employee obtain the appliances it is presently promoting. It pays full cost of wiring for ranges, dryers, and water heaters. It doesn't require the employee to demonstrate the appliances, but it finds that most of them do.
- It encourages "kitchen parties" in which the worker's family entertains friends and shows off the new appliances. Public Service finds that slightly over 95% of employee homes now have kitchen ranges and the percentage of those with complete home laundries is climbing rapidly.
- Workers join in actual floor selling of dealers' appliances on display in company offices. "Tip slip" payments are made on final sales just as they are on sales resulting from neighborhood canvass.
- In larger towns live range demonstrations are held regularly in super markets with cooperation of the market operator and local dealers. Here again, volunteer employees work with home service demonstrators to develop "tip slip" leads.

Public Service of Oklahoma with 182,961 residential customers has been showing steady gains in residential sales since 1951. Average residential use per customer moved up from 1,222 kwhr in 1951 to 2,063 kwhr as of last July 1. (This is a natural gas area). Ranges on its lines jumped from 8,600 to 23,928 in the same period. In these gains lie the reasons for its conviction that its employee sales program, as basic part of its overall promotional efforts, is well suited to its needs and to the peculiarities of its own specific territory.

Washington WP Backs Wiring Legislation, Girds to Battle Coming Gas Competition

When New Year's Day 1955 dawned on Washington Water Power Co, it found itself with two sales tasks, both of which to many another utility would seem like blessings:

1. With average customer consumption already hitting 6,910 kwhr per year, how could it boost it another 500 kwhr before the year was ended?

2. Natural gas competition was on its way, certain to be there by mid-1956. What must be done to get the house in order and avoid losing not only existing customers but new ones as well?

GETTING READY FOR GAS—Washington Water Power sees the first shipment of 200-amp meter sockets arrive in Spokane following passage of city ordinance

Foresight Proves Worth

Thereby hangs not just one tale, but many. And all attest to WWP's foresight in meeting a situation before it gets out of hand.

With range and water heater saturations both in the neighborhood of 85% the problem of selling the remaining 15%, the company felt, was a necessary continuing problem, but one that couldn't be too much reduced. The replacement market didn't offer much promise either. A survey showed that less than 10% of the ranges on WWP lines were more than 15 years old.

Sell Major Appliances

Says Kimball Jack, general sales, promotion, and information manager: "Because we as a company are not permitted to promote actively electric house heating at this time, we knew that to obtain our quota of 500 kwhr per customer increase, those kwhr had to be obtained from sale of such appliances as automatic washers, dryers, electrostatic air cleaners, year-round air conditioning and some type of supplemental electric heat that would help to stay the advance of gas heat."

That then was the direction the company moved, and these are the methods it employed:

• It first turned to the water heater. This is the company's biggest single producer of kwhr and the one most vulnerable to gas competition. Two programs were set up: one stressing the importance and need of the new quick recovery water heater, the other a conversion program to build up wattages of existing 30, 40, and 52-gal water heaters where owners were running short of hot water (EW, Aug. 29, p 51).

• With the high saturation of refrigerators, it seemed promotion of true two-temperature refrigerators along with freezers would provide a new load over and above the existing refrigerator load, but with essentially all its virtues. From this thinking came a "Freezer Leisure" campaign with traffic building prize contests.

• In a new effort to build up its dealer sales organization, the Inland Empire Electric League, it boosted membership from 83 to 346.

• It built up its builder-contact program and started a "Reddy's Hook-Up" wiring finance program. As of mid-year it had $100,000 worth of rewiring contracts on the books.

• It continued experiments with an electric heat pump using the air well as a heat source and a low-wattage resistance type heater in the furnace plenum of customers now using oil.

Finally, it took some daring and spectacular steps to promote better wiring. From this emerged Spokane, WWP's headquarters city, as the first city of its size in the U.S. to modify its electric code to require that all new residential construction "be such that without costly rewiring of the service entrance, capacities up to 195 amps in the home can be served."

WWP's homes use some 7,000 kwhr annually. Local codes, points out the company, were patterned after the National Electrical Code, which is predicated on national average consumption of approximately 2,400 kwhr annually.

"Something had to be done to break this bottleneck," says Jack. "Knowing from experience that ordinary methods of wiring promotion are slow, costly, and tedious, we felt that only by legislation could our problem be

solved. Accordingly we conceived and put into effect our Expandable Wiring Program.

"Here's how that was done. After a study of the home's electrical system, it was determined that the service entrance was the key to future expansion. A 200-amp heavy duty meter socket and 1½-in. rigid conduit were proposed.

"Next question was how to accomplish this in the shortest possible time. Structural codes are based on future expansion, why not the Electrical Code?

"A letter of explanation was mailed to all interested parties, outlining our mutual problem and offering this inexpensive solution. Public announcements, ads, and publicity went into daily newspapers. A Wiring Standards Committee was formed to explore the proposed solution. Members included representatives from the electrical industry, home builders, architects, lending agencies, and government authorities. Written endorsements were obtained from all..

"Manufacturers of meter socket equipment were asked to furnish a socket with full 200-amp rating at a fair price, and a Code Committee was activated to formalize these recommended changes. The code revision was then presented to the City of Spokane and unanimously adopted. Finally, the same solution was presented to the council of each city that maintains an inspection department."

Commented Jack on the program: "It has been an unquestionable and effective sales aid for such appliances as the dryer, quick recovery water heater, and dishwasher and will reach its full usefulness as time goes on."

WAY NO. 8--Sell Through the Back Door

Idaho Replaces Water Heaters; Detroit Ed Modernizes Ranges to Turn Up New Prospects

Sales go in through the back door in customer relations plans offered by Idaho Power Co and Detroit Edison Co.

At Idaho, the utility pays a $12 bonus to dealers and plumbers for each complete new home or farm water heater installation which replaces an inoperative one. It plugs the plan through regular ad media plus telephone directory advertising, bill stuffers, and on routine customer calls. Signs are also posted on water heaters urging customers to call the company office in case of water heater trouble. All requests received are turned over to the dealer or plumber of the customer's choice.

The company goes all out to bring the buyer and seller together even to the extent of transporting the customer to the store. Dealers and plumbers, on the other hand, notify the company the moment they get a request for water heating service, and company men hustle to the customer with the electric heating story.

The customer also gets several company services. Among them: Free inspection upon request, disconnection of old unit and reconnection of the new provided additional wiring is not needed, free engineering services to assure efficient installation, and wiring finance help up to $200 if a major rewiring job is necessary.

Big Market For Replacements

Detroit Edison, by coupling a continuing range modernization program with a liberal trade-in offer, has come up with a method of getting old ranges off the line and new high-speed units on. With 70,000 of its some 352,000 electric ranges equipped with the old open coil, cast or ring type surface, it makes for quite a market.

The company range repairmen carries out the first part of the program. When making a range repair call, he explains he can modernize all surface units and switches where needed for not more than $15 with six months to pay. (This is for a four-unit range. Detroit Edison replaces the first unit and switch free, additional units at $4 each and switches $1 each. A new 3-heat switch for the deepwell is installed at no cost.) The repairman leaves the customer a letter explaining the program in detail.

The sales staff then takes over the "sell up" part of the program. Last paragraph of the repairman's brochure invites the customer in to see a new range and offers a liberal trade-in allowance for the old range. Several manufacturers tied in by offering ranges at special prices ranging from $179.95 up. A $10 allowance is given the dealer for the old range taken as trade-in.

When the range repairman learns the customer is interested in a new range rather than modernizing the old one, he makes a note of it on his repair order. This is filed in the local office. When ten or more prospects are lined up, a home service advisor stages a demonstration with office staff members on hand to write up the orders.

EACH "CLUNKER" REPRESENTS A SALE--To prevent traded-in ranges from finding way back to market, Detroit Edison pays dealers $10 a unit, then sends them to scrap pile

Getting Ready for Heat Storm

Kansas City Power & Light Co used the "you" approach in this ad to explain heavying up of its distribution system to handle the summer air conditioning load. Company spent $6 million this year in it's overhead construction program. Ad also invites reader to heavy up his own home wiring.

"Darling will you marry me?"
—We'll go to the Riviera on our honeymoon
—We'll have that dreamhouse you've always wanted
—I'll do the housework for you
—I've got a Room Air Conditioner, too!"
the ELECTRIC CO.

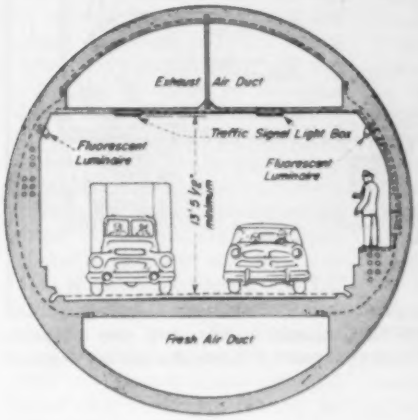
Breezy Ads Sell Air Conditioning

Columbus & Southern Ohio Electric Co rested a large part of last summer's air conditioner promotion on series of cartoon ads with a gag twist. In this sample, girl is cool to boy's marriage pleas until he informs her he has a room air conditioner.

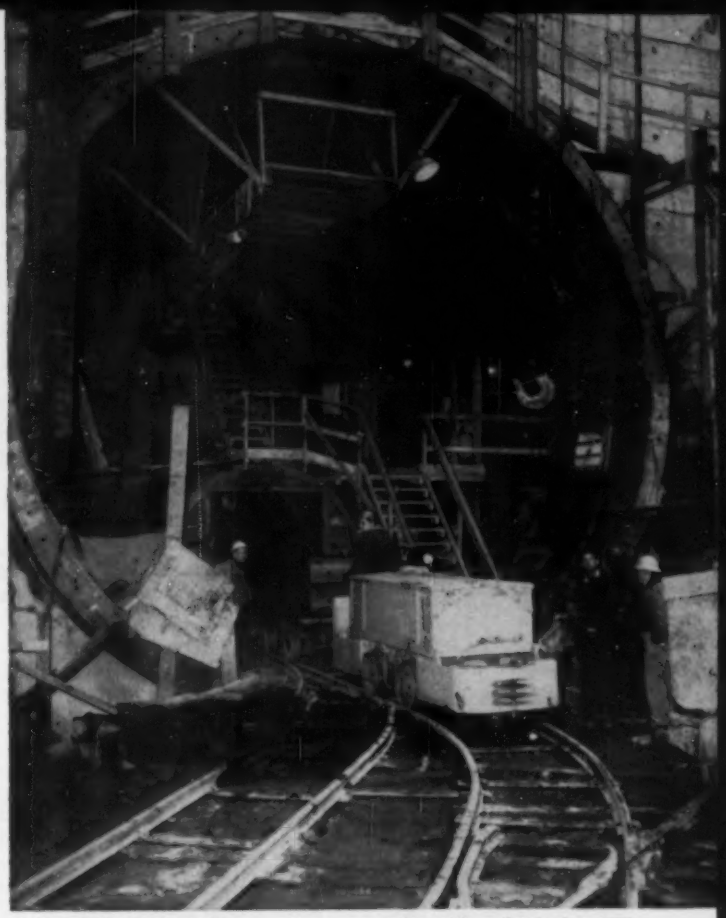
Tough Turkey, These Sales

This traffic-building promotion sold three ranges, one refrigerator, four washers, and three dryers for a dealer in Ohio Power Co's territory. Just before Thanksgiving he advertised for "biggest, oldest and toughest" turkey in the county. Next, he invited people to come in and guess it's weight, with prizes given for the best guesses. This brought the townspeople streaming. Then, after choosing the winners, the enterprising dealer lured them back to his store for a second time. He announced he would roast this "biggest, toughest, etc" turkey on a new electric range and serve free turkey sandwiches and coffee for all comers. Did anyone buy? Look at the figures.

INDUSTRIAL Design



Fluorescent Lights in a 1,200/2,080-V Multiple System Create a Striking Contrast to Present Practice as . . .



MEN ENTER MUCK LOCK to work on new tube. When finished in '57, the tunnel will resemble in cross-section the diagram shown above

Lincoln Tunnel Gets Unique Lighting

The third tube of the Lincoln Tunnel, now being built to link New Jersey with Manhattan, will have a unique lighting system. Engineers at the Port of New York Authority created a 1,200/2,080-v multiple system to free themselves of the fetters imposed by present fluorescent practices.

Two 72-in., T-12 fluorescent tubes in a glass envelope and a simple reactor-type ballast will form a lighting unit. Each pair of tubes will be connected in series and will be wired from phase to ground.

Separate Lighting Circuits

Each side of the tunnel will draw its power from a different source so that all lights will not blink out in case of trouble. Furthermore, contiguous light units on a side will be wired to phases A, B, and C, respectively. Lighting circuits will be fed by three single-phase transformers protected by individual 2-pole circuit breakers. Should cable trouble develop in one phase, only about 5% of the total light units in the tunnel will be extinguished.

The odd lighting voltage was dictated by the winter starting characteristics of two tubes in series. Because ventilating fans will be able to change the air about once each 90 sec, the temperature inside the tunnel will about equal the outdoor temperature.

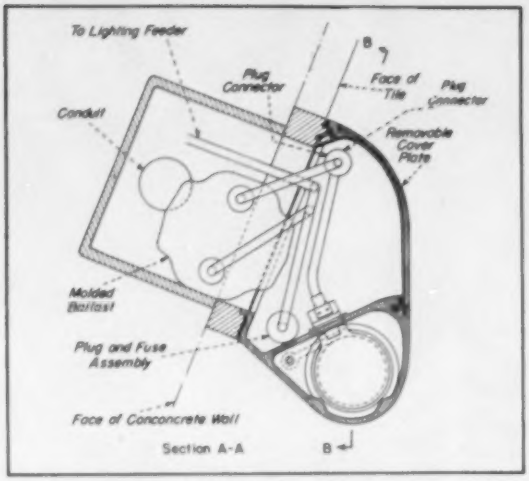
But as summer approaches, it will be unnecessary to impress 1,200 v across the pair of fluorescents to strike the arc. On warm days they will fire at only 800 v. In addition, Electrical Engineer Carl R. Johnson wanted to control light intensity to compensate for seasonal changes of temperature and lamp aging. So three transformer taps will be provided for the lighting circuits.

Operators will make seasonal or intensity adjustments by switching the lights from 800 to 1,000 v, or to 1,200 v. The light units will draw a current of about 325 ma in the normal tunnel zones; the current decreases in four steps from 600 ma at the New Jersey portal over a distance of about 800 ft to 325 ma. The total light load in the new tunnel will average about 350 kva.

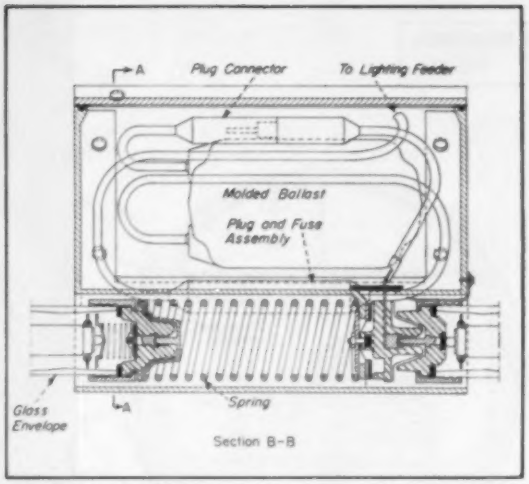
Even Illumination Desired

Lighting in the tunnel will run about 8 to 10 ft-c, about four times the light level in the two existing tunnels. Actually Port Authority electrical engineers were not so concerned with the light level as with brightness ratios within the major field of vision as contrasted with walls and ceiling. The object, of course, is to provide even illumination on the walls and ceiling.

To achieve this, engineers will place the fluorescent fixtures carefully near the ceiling (see diagram). The lights



LIGHTING FIXTURE ASSEMBLY is arranged so that ballast can be changed easily without removing fluorescent fixture



PLUG CONNECTORS, special ballast, and fuse assembly lend versatility to this system if future changes are required

will illuminate the walls and ceiling surrounding them (as opposed to lighting the opposite walls). The white, highly reflective wall tilings will keep the tubes from appearing too bright to motorists.

Because this high-voltage lighting system obviates voltage transformation at the lights, a simple reactor-type ballast can be substituted for the conventional transformer type. Port Authority engineers have designed a molded jacket type with molded leads and plug connectors. The appropriate phase will be tapped at each fixture and equipped with a female plug connector. The ballast will plug into this receptacle. Furthermore each ballast will have its own cartridge fuse molded into the line lead to give individual protection to each fixture.

Easy Maintenance

This arrangement yields tremendous flexibility. If a ballast goes bad, it is merely unplugged and changed. Workmen will be able to get at it without removing the light fixture. And if engineers some day decide to boost the light level in the tunnel, they may do so simply by substituting a reactor of lower impedance.

In addition to those advantages, this lighting system also invokes the usual economy of high-voltage transmission—No. 6 wire will carry the lighting load in the tunnel. The system also enables engineers to extract the most from the lamps. Voltages can be boosted as the tubes grow dim with age. And if one tube or a light unit goes bad, no other light units are knocked out of service as sometimes happens in a series hookup.

Other Lighting Aspects

This 1,200-v fluorescent system admittedly is but one phase of the whole electrical project. The general Lincoln Tunnel undertaking includes enlarging and relighting the approaches and plazas at both ends of the tunnel. Fluorescent street lights (standard, four-tube units) will demand another 150 kva and will replace existing sodium vapor lights. Spaced an average 90 ft apart, they will operate on 265/460 v.

Plazas will be lit by 500-w reflector floods mounted 70 to 90 ft high on towers. Engineers say they are shooting for a general illumination of 1 or 2 ft-c in the plaza areas. These incandescent units will take power at 120 v.

One-hundred and fifty sand hogs working four 'round-the-clock shifts are now drilling out the 31½-ft diam hole under the Hudson River. When completed in 1957, the tunnel will provide a two-lane eastbound avenue to New York. It will measure 8,100 ft from portal to portal, will present a 6,700-kw connected load, will draw an average 3,000 kw, and will require a mere handful of operators at a remote control panel in the New Jersey ventilating building.

Power will be supplied through six basic circuits. Public Service Electric & Gas Co will feed the existing New Jersey substations at 4,160 v. Consolidated Edison Co will bring power to the existing New York substation at 13.2 kv. Any two of the 4,160-v feeders or of the 13.2-kv feeders can carry the entire tunnel load.

Engineers will capitalize upon the existing two substations which currently serve the two operating Lincoln Tunnels. Both substations have excess capacity to meet any reasonable power emergency. To maintain this power reserve, engineers will add 7,000 kva of transformer capacity although 3,500 kva is about all that is required under normal conditions.

Power will be distributed to lights, ventilating fans, and pump motors through a radial system. Lights in the ventilating building will operate on 120/208 v, but these incandescents will be seldom used because operators will be clustered in the control room. Fan motors in these buildings, however, will be fed 460 v.

Quick Power Switching

Switches and circuits are arranged to yield versatility. If trouble develops on one source of power supply, the operator will be able to select and throw an alternate source on the line in less than 60 sec.

The subterranean tube is divided into four ventilation zones. Each will have its own exhauster and blower fans, and in each zone a spare exhauster and blower will be available. Each long river zone will have three exhausters and two blowers, plus one spare of each.

Ventilation depends upon traffic

density, whether traffic is climbing a grade or coasting down one, and whether autos, trucks, or a mixture of both make up the bulk of the vehicles. More ventilating is required when traffic is "truck heavy" because more combustion products are released, and the same situation prevails on upgrades. To provide versatility in ventilation, the big centrifugal fans will, in general, be driven by two-speed motors. This will enable operators to select full, two-thirds, half, and quarter speeds for the fans to meet fluctuating traffic demands. Power consumed varies as the cube of the air volume moved, so the largest fan which draws 270 kw at full speed will draw only 4 kw at one-quarter speed. At full speed it will move about 300,000 cfm.

Ventilation will be controlled closely. Recording-indicating instruments will monitor continuously the percentage of carbon monoxide in the exhaust gases. Operators will make adjustments on the basis of this record.

Two ventilation buildings, set on opposite banks of the Hudson, are being built to serve the new tunnel. Each will handle two tunnel ventilating sections. About 4,300 hp in motor capacity will be required for full ventilation.

The fan wheel and shaft of the biggest fan unit weighs 7,200 lb. The fan wheel has a 94-in. diam. The largest fan motor has a 350-hp rating. It operates at 440 v and is started across the line. It requires about 30 sec to reach top running speed and presents the usual starting-current problems. To minimize voltage disturbances while fans are accelerating, engineers will install a system of frequency relays to govern sequences of starting.

The large motors are connected to the fans directly through flexible couplings. The small motors, in general, are connected to the double-extended shafts of the large motors through geared down chain-and-sprocket transmissions. This arrangement enabled engineers to house the fans in smaller buildings.

Dampers at the inlet of each exhaust fan room will be about 8 ft wide and 18 ft long. Through speed reducers, motors will operate the dampers when the fans start or stop. Electrical interlocks will keep the dampers from opening until the fans have started to accelerate. This will prevent reverse idling of the fans with intensified current-surge problems upon starting. Similar provisions will be made for the blower fans.

Exhaust fans will be somewhat larger in capacity than blowers. This is to compensate for the slight increase in air volume due to the addition of exhaust gases and to air expansion as it mixes with the hot exhaust gases.

Designing and constructing such a project as a new Lincoln Tunnel is a staggering undertaking. Many contracts already have been signed but a few remain to be let.

Although engineers followed many designs similar to those incorporated in the two older tubes, the lighting system described here seems to be unique in the United States. It is felt that this unique lighting system will prove satisfactory in service and will be used to advantage elsewhere in the future.

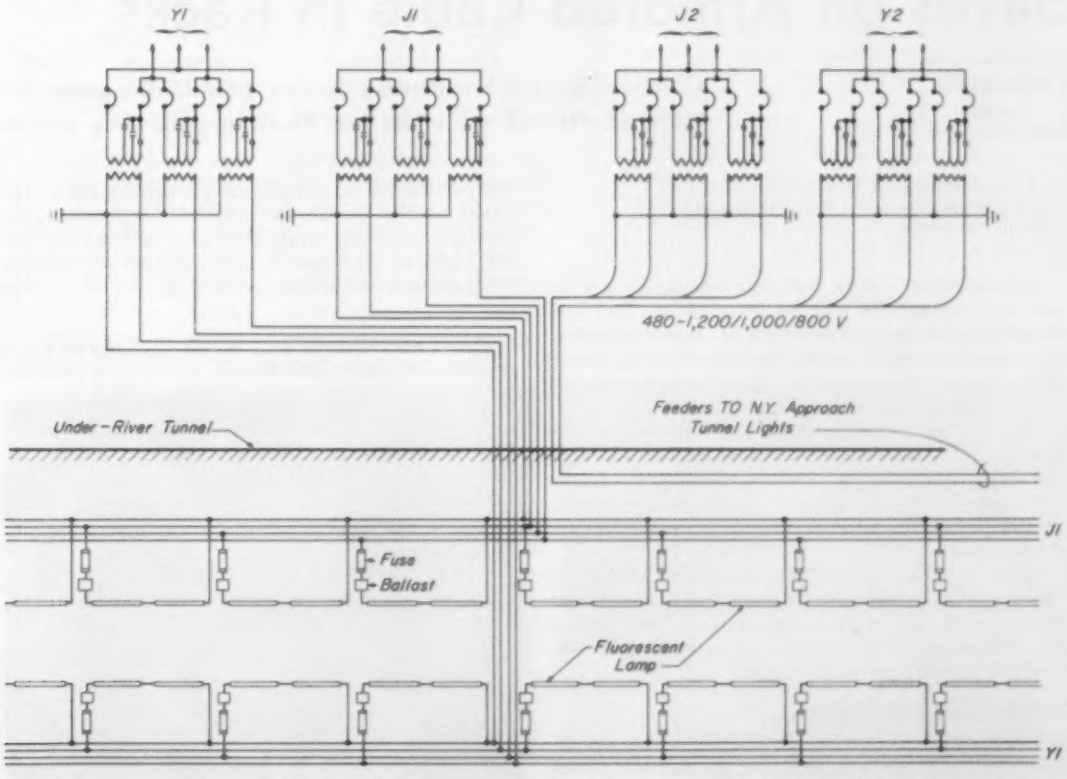
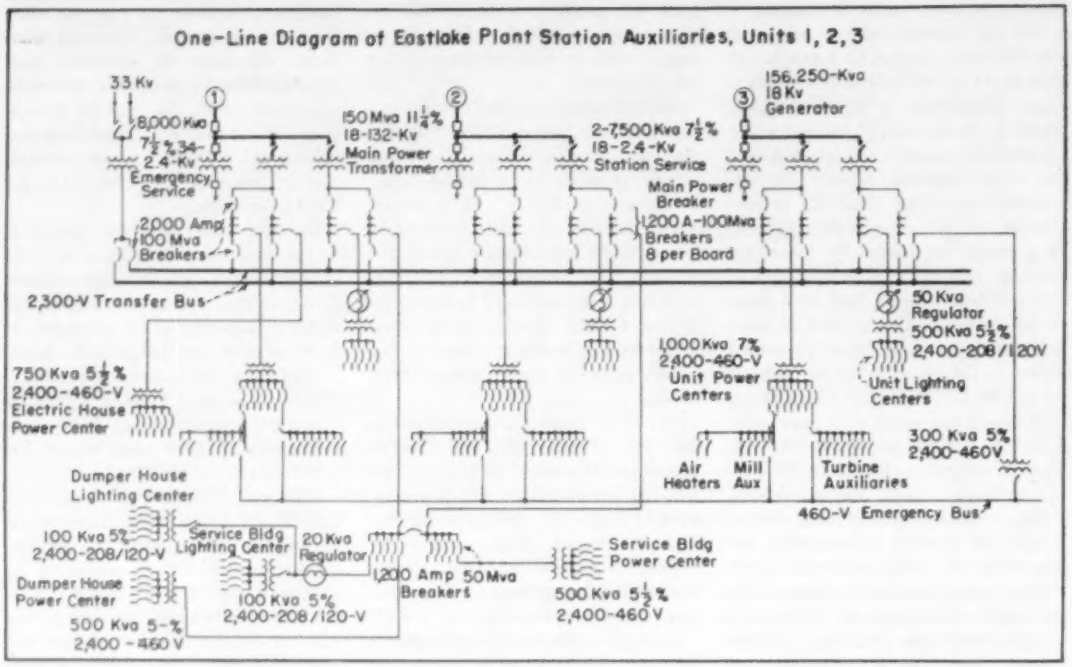


DIAGRAM SHOWS HOW TUNNEL LIGHTS WILL BE SUPPLIED. OLD TUNNELS WILL CARRY HEAVY POWER FOR NEW



Saves on Armored Cable in Racks

GENERATION
Design

Cleveland Electric Illuminating Co uses it for 2,300-v power circuits indoors and out at its new Eastlake generating station

C. F. PAULUS, General Supervising Engineer, Plant Substation Engineering Dept, The Cleveland Electric Illuminating Co, Cleveland, O.

Armored cable in open racks has considerably cut the cost of installing 2,300-v power circuits at the Cleveland Electric Illuminating Co's new Eastlake generating station. The cables were easily installed and have a service record to date that appears promising. CEI will use them also in Eastlake's fourth unit.

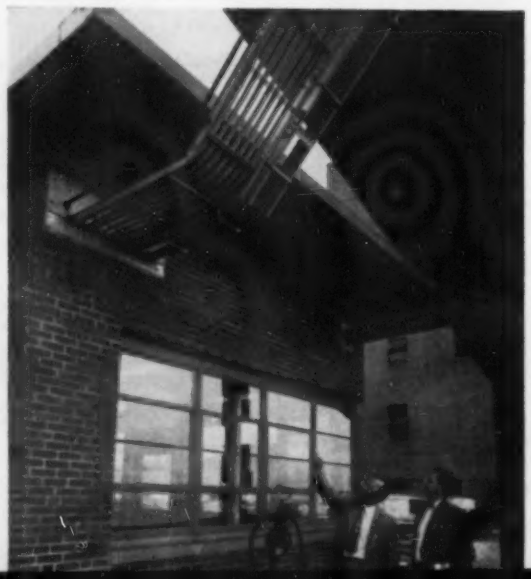
Simplicity of electrical circuits was emphasized by the designers of the Eastlake Plant, where the only normally closed electrical tie among its three units is the 132-kv bus in the transmission substation. Although some conduit was used for lighting circuits and communications, it was nowhere imbedded.

The armored cable in racks is used both indoors and outdoors. The aluminum racks, as well as the aluminum baskets supporting the Neoprene-jacketed control cables, were treated as current-carrying members and were integrated in the plant grounding system.

Splices, Taps Not Needed

The 2,000-amp circuits, connecting station service transformers to the boards and tying the boards together, are five parallel 500-MCM 3-conductor cables with VC insulation, PVC jacket, and aluminum interlocked armor. This construction is used also for the transfer buses. The cost of cable for this bus was about $36 per 3-phase ft. As aluminum racks were much lighter than the fabricated bus, they were easy to install. Transformers and switchboards were furnished with terminating facilities. All cables could

OUTDOOR RUNS between buildings are supported by simple extensions of indoor racks. Weather protection is unneeded



be brought into the switchboards and taken out again through such terminating facilities to eliminate cable taps and junction boxes.

At Eastlake all 2,300-v feeder circuits are armored cable lying in ladder-type racks. As far as practicable, a common rack serves for several circuits. When cables must leave the rack, they are supported on individual aluminum channels to the motor fitting.

Motor circuits were based on 125% of rated full-load amperes. A circuit rated at 420 amp was calculated to require a 500-MCM, 3-conductor, VC-insulated, aluminum-armored cable. Such cable costs approximately $9 per ft installed, including the supporting rack. A similar installation made with conduit would have required three 750-MCM cables in 4-in. conduit, and its cost would be about $14 per ft. For most uses, however, the same size conductor would have been required in either armored cable in racks or conduits.

More than 36,000 ft of armored cable was installed for the first three units at Eastlake.

Switchgear Space Saved

This reduction in the cost of auxiliary power circuits in the power plant permitted the electrical designer to cooperate more closely with the other engineers to achieve lower overall costs. Indirect cost reductions may exceed direct savings. For instance, considerable cost reductions may be obtained through the elimination of auxiliary boards, except those for the coal-handling and service building loads. CEI found it more economical to feed all motor circuits from the main auxiliary service boards. This made it economically permissible to install all auxiliary metal-clad switchgear in a single room relatively free of dirt and in a part of the building not otherwise usable. Such location helped to keep down the total cubic contents.

For the past 25 years CEI has used two-speed fan motors. For these a single circuit from the breaker in the switchboard to the motor and two breakers at the motor were installed. The space occupied by the latter breakers was both valuable and dirty. The lower cost of armored feeders now used permits the installation of two circuits, each having its own breaker at the switchboard. Consequently, the new installation involves a saving in breakers and keeps them away from the dirt.

Another indirect saving is obtained from the ease of installation of armored cables for temporary use in an emergency. Without this feature CEI would not have decided on the present spartan simplicity of circuitry and the absence of double-ended substations.

Other Gains Cited

No attempt has been made to evaluate in dollars and cents the following other advantages afforded by armored cables in open racks:

1. Greater safety because the cables are always shielded.

2. Complete freedom in making the right phase connections in 2,000-amp bus circuits—no costly crossovers.

3. Cables need not be secured to prevent movement during faults.

4. Armored cables are so flexible that additional flexible connections are not needed at the motors.

5. Armored cables have lower reactance. This fits in with the basic philosophy of over-exciting motors to improve their performance during voltage dips.

6. There is greater flexibility for changes in design during construction or service.

7. Spares are easy to store and do not deteriorate while in storage.

8. The same cable can be installed indoors or outdoors.

9. There is no condensation such as occurs inside conduit and metal-enclosed buses. No venting or draining is necessary.

10. The number of joints is kept to a minimum.

11. Fewer types of cable and cable fittings are required.

12. Thermal changes cause no friction wear on the insulation.

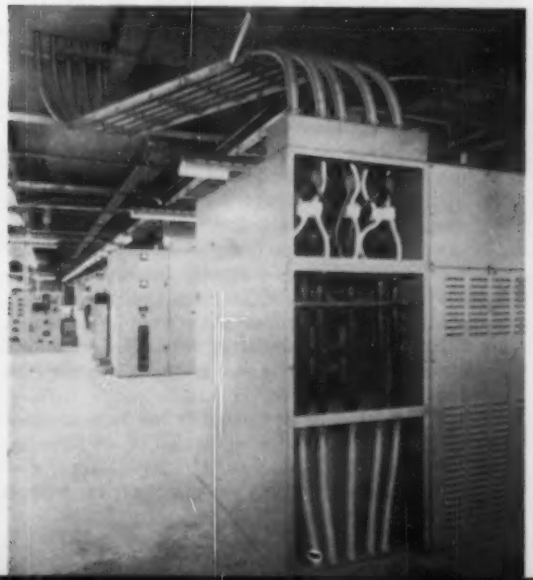
13. Cables can be readily moved out of the way to facilitate repair work to other apparatus.

14. Cables can be readily replaced.

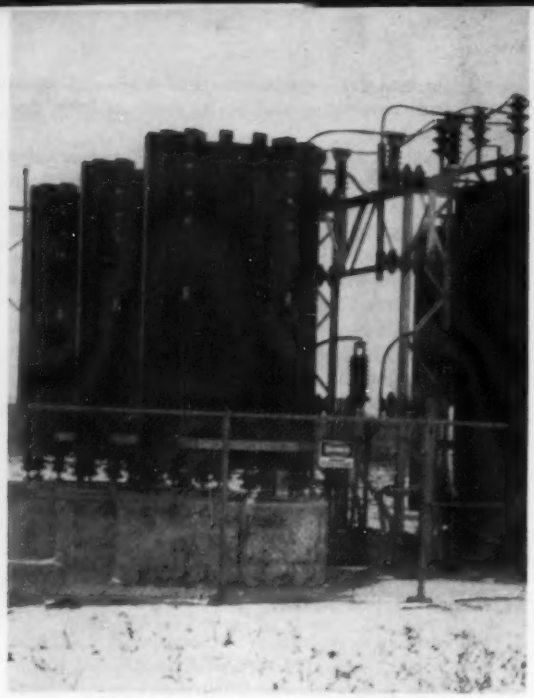
15. The cable and insulation suffers a minimum of damage during installation.

16. Crossovers and cable routing are easy and the final appearance is excellent.

TERMINATIONS in switchgear cubicles are simplified by following conventional armored-cable installation techniques



FLEXIBILITY and inherent strength permit forming armored cable to unusual runs and support by open aluminum racks



Two synchronous condensers, like this, three reactors, and a transformer . . .

Here's How Detroit Edison

INDUSTRIAL Design

Regular measures were inadequate because the new furnaces reversed importance of "cyclic" and "extremely frequent" flicker

S. W. LUTHER,* Assistant Chief Planning Engineer,
C. E. QUICK, Industrial Power Planning Engineer, and
J. D. GHESQUIERE, Senior Planning Engineer—Industrial Power,
Detroit Edison Co., Detroit, Mich.

Specially designed synchronous condensers and reactors can be credited with preventing objectionable voltage flicker on part of Detroit Edison's system when a steel mill added two big arc furnaces.

Engineers previously have minimized arc furnace disturbances on the system by using the "extremely frequent" flicker rate as the critical factor for consideration. Extremely frequent flicker occurs between one and sixty times a minute.

But a 16,000-kva furnace, which was operating in the mill already, had made engineers aware that "cyclic" flicker (more than one flicker a second) was becoming a critical factor. The two new 25,000-kva furnaces merely would have intensified this situation.

The existing four furnaces were the largest that could be supplied on the existing system; so changes had to be made. Adequate power had to be supplied, and flicker had to be suppressed.

The final arrangement involved two 30% reactance 50-Mva synchronous condensers on the buses of the substation serving the steel mill. Three 75-Mva, 50% reactors were added to the bus feeders. Machines and reactors had to be specially designed for this application.

Here are the details:

Before the new furnaces were installed, the steel mill had one 13,333-kva, two 15,000-kva, and one 16,000-kva direct arc furnaces with maximum secondary voltage of 320 v. The supply was from a power plant 120-kv bus having a short circuit capacity of 2,000 Mva at minimum generation. The 120-24-kv stepdown station supplying the arc furnaces is near the steel plant, about three miles from the power plant. The 24-kv buses supplying the steel company are isolated from other loads.

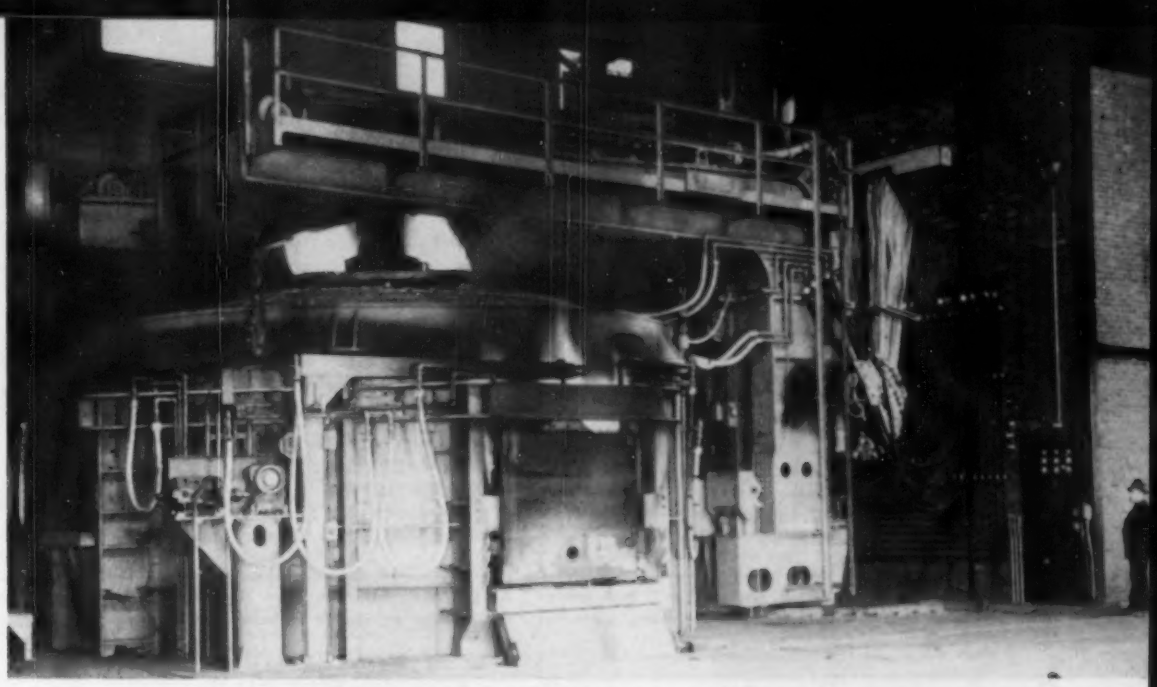
Existing Furnaces Approached Maximum Size

The existing furnaces, already approached the maximum size which could be served satisfactorily from the 120-kv bus at the power plant. Therefore, studies were made to determine what changes would be necessary in the electrical system to keep voltage flicker, especially in the cyclic range, within acceptable limits.

Flicker voltage limits for Detroit Edison are 0.5 v for cyclic flicker and 1.0 v for extremely frequent flicker on the power plant bus, on a 120-v base. Cyclic flicker was defined as voltage fluctuations more often than once a second. Extremely frequent flicker was defined as voltage fluctuations more often than once a minute but less than one a second.

Extremely frequent flicker generally has been accepted as the flicker limitation in the application of arc furnaces.

*Based on AIEE Transaction Paper 55-743 III presented at the AIEE Fall General Meeting in Chicago, Oct. 3-7, 1955.



. . . prevent arc furnace flicker from disturbing a utility's power system

Licked Arc Furnace Flicker

Cyclic flicker caused by arc furnaces has not been used as a limitation to operation. Records indicate that the kva swings of the cyclic flicker were too small to cause visible light flicker. The application of the first 16,000-kva installations on Detroit Edison's system forced engineers to consider cyclic flicker as a limitation. The new 25,000-kva furnaces accentuated the problem.

Each new furnace is supplied by a 25,000-kva transformer. When water cooled, the transformers can handle 33,000 kva. Maximum secondary voltage is 510 v. The determination of the most economical method of serving the new load satisfactorily required an accurate evaluation of the expected furnace load swings.

Evaluation of New Furnace Load Swings Needed

To determine these load swings, engineers obtained preliminary design data for the 25,000-kva transformers from the manufacturer. Load swing predictions were based on all available data, experience, rules of thumb, calculations, and extrapolation of curves to include 25,000-kva transformers. The final load swing estimates were 15,500-kva, single phase at 60% power factor at an extremely frequent rate (less than one a second), and 11,000-kva, single-phase at 60% power factor at a cyclic rate.

The limiting factor is the permissible flicker to other customers. The power plant which serves the area, including the steel mill, has three operating buses tied together by regulating transformers. Generators are distributed over the buses as required for system loading and operation. Any major change in bus arrangement would involve both economics and system operation. Therefore the problem was to find the best way of serving the new load economically without disturbing the system needlessly.

Several arrangements were considered:

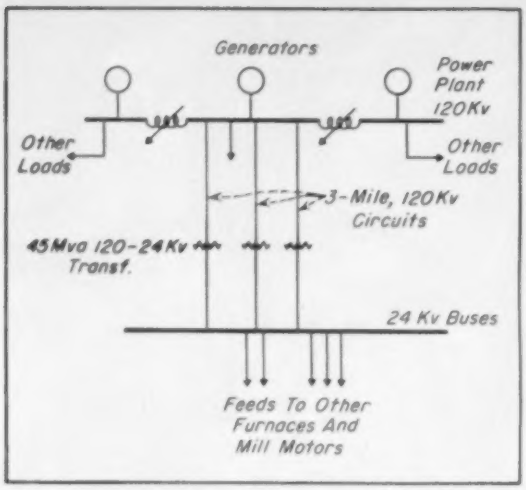
One way was to isolate the new load from other power plant load. However, the amount of generation required for the heavy load swings is not consistent with basic load. Also while the load factor of the steel plant load is relatively high, there are frequent periods when the load is nearly zero. This type of load fluctuation is not consistent with efficient—or even practical—boiler and generator operation. This method was discarded.

A second way of serving the load was through rearrangement of the power plant buses to increase the available short circuit capacity, thereby to absorb greater load swings. Such a rearrangement would have been costly and would have restricted efficient system operation considerably. This method too was discarded.

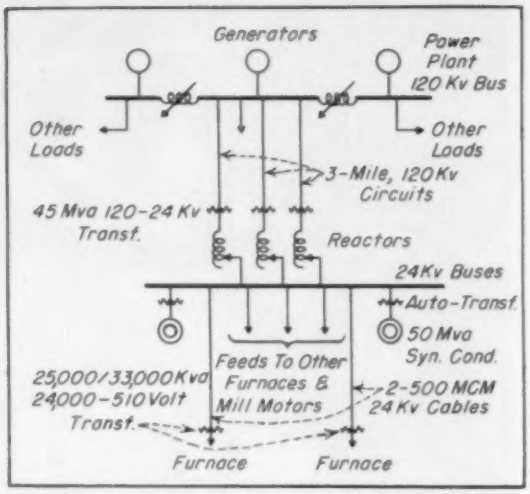
A third way was to continue supplying the new furnace load from the existing system and to install corrective measures at the 24-kv substation bus supplying the steel load. The installation of adequate reactive generation, using synchronous condensers, near the load would minimize flicker on the remainder of the system. This method was chosen.

Calculations Showed Amount of Reactance Needed

Load considerations, and system stability for the customer's mill motors, resulted in a decision to use three 120-kv feeds to the stepdown station and three 120-24-kv transformers and to operate with the 24-kv buses tied together. Calculations indicated that this arrangement would require 100 Mvar of low reactance synchronous condensers on the 24-kv bus. This would reduce the cyclic flicker to the permissible limit on the 120-kv power plant bus. As the 24-13.8-kv associated auto-transformers rep-



BEFORE furnaces were installed, the steel mill took power from 24-kv buses without any special corrective measures



AFTERWARD, furnaces were supplied by similar arrangement. New equipment includes auto-transformers, reactors

Condensers, Reactors, and a Transformer Kill Flicker

resented 3% reactance, 100-kva base, about 100-Mva of 12% transient reactance condensers, or 300-Mva of conventional condensers, were required.

The installed cost of 300-Mva of conventional condensers would have been high. Space requirements and operating complexities also made this installation undesirable. This method was discarded.

A Satisfactory Arrangement Finally Was Found

So the use of series capacitors with standard condensers to reduce the reactance was considered. This type of installation was ruled out when costs and operations were analyzed. Limited information was available as to the cost, design, size, and characteristics of very low reactance synchronous condensers.

Decision finally was made to install relatively low reactance machines and also to install reactors in series with the 120-24-kv transformers thereby forcing the condensers to help compensate for the load fluctuations.

Stability studies were made using various combinations of condensers and reactors. These studies indicated that two 50-Mva, 45% reactance synchronous condensers and 75-Mva reactors of 80% reactance would be unstable. Therefore, two 50-Mva, 30% reactance condensers were installed on the 24-kv buses with 75-Mva, 50% reactors in each of the three feeds to the buses. This combination is well within the safe margin of stability and was the most desirable combination when costs, delivery, performance, flexibility, and existing station installations were considered.

The final installation is shown in a diagram. The power plant 120-kv bus has a short circuit capacity of 2,000 Mva at minimum generation. Transformers at the substation serving the steel mill are 45 Mva, 120/24 kv. Reactors in the three transformer feeds to the 24-kv buses each have one, single-phase, air-cooled air-core unit per phase. They are outdoor type, 12,500 kva, 6,920 v, 1,800 amp, with 35-40-45 and 50% taps, 75-Mva load capacity.

The 24-kv buses are of ring design. Two auto transformers for the synchronous condensers are 48/64 Mva, 24/13.5 kv, 2.8%.

The two synchronous condensers are 50,000 kva with ½ lb hydrogen, 60,000 kva with 15 lb hydrogen. They have water-cooled heat exchangers which use a cooling tower. They operate at 13,800 v, 600 rpm. Subtransient reactance is 17.5%. Transient reactance is 30%. Synchronous reactance is 91%. Electronic automatic field control is cross-compounded.

Furnace feeds are two 500 MCM, 3/c, 24-kv cables, 6,000 ft long for each 25,000-kva furnace. There are four other furnaces and three mill feeds from the common 24-kv buses.

The two new electric furnaces are 150-200 ton, 24-ft diam. Each is supplied by a water-cooled, 3-phase transformer, 4% impedance when connected 24,000/510 v. Voltage ratios and taps are 24,000/510-470-390-294-270-156.

Tests Confirmed Load-Swing Predictions

Oscillographic tests conducted after the new furnaces were placed in operation showed a cyclic flicker of about 0.5 v on a 120-v base, or 0.4% at the 120-kv bus. The tests also confirmed, within reasonable limits, the load swings predicted from calculations. Although the single-phase swings at the extremely frequent rate were slightly higher than anticipated, the variation was not sufficient to be serious or critical. The cyclic swings were close to the anticipated values and are the limiting factor for these large furnaces.

Tests were also made at the metering room adjacent to the furnace installation. The 24-kv metering transformers in the individual furnace feed were used for current and potential measurements. Instruments and meters used were integrating kilowatthour and kilovarhour meters; graphic kilowatt and kilovar meters; voltmeters; ammeter;

and a six-element oscillograph which recorded 3-phase amperes, kva, and volts. A voltage biased oscillograph was used for measurement of voltage flicker at the power plant 120-kv bus.

Arc Furnaces Produce 3 Kinds of Load Swing

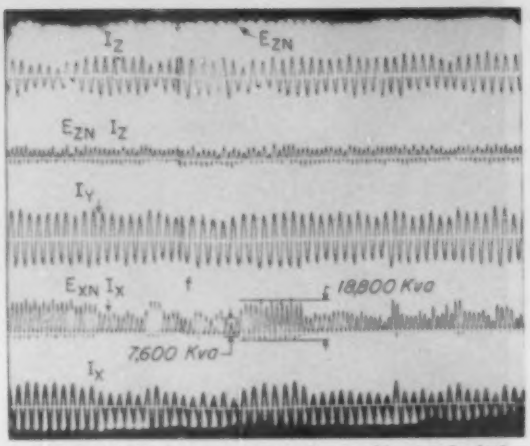
During previous tests on other furnaces and again in these tests, it was noted that the operation of large furnaces produce three different types of load swing with resultant voltage disturbances. All three types occur during the early periods of a melt before stable operation is reached. They are:

1. Cyclic: The type of load fluctuation which has a magnitude of about 11,400-kva, single-phase, at 60% power factor, with a duration of 4 to 12 cycles. This disturbance occurs from 4 to 6 times a second. The fluctuations are present during the first 30 min of melting after a cold charge of metal. This frequency of variation results in a cyclic flicker of the frequency causing the greatest irritation to the eye.

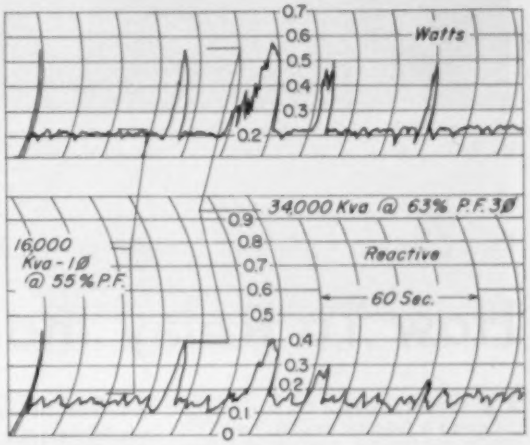
The rapidly recurring single-phase fluctuations are superimposed on the longer duration 3-phase load swings. The variation in power factor is from a normal of 75% to 60%.

2. Extremely Frequent: The type of load variation which has greater magnitude and a lower rate of occurance than Type 1. These single-phase load swings of 19,000 kva at 60% power factor occur at random intervals but no more often than once a second. These load swings are most severe during the first 10 to 15 min after a cold charge of metal. This is the usual single phasing which has been accepted in the past as the limiting factor in the application of arc furnaces and is shown in the accompanying charts.

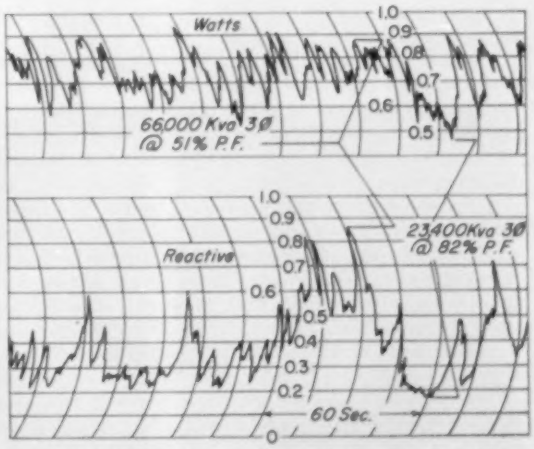
3. Gradual: The type of load change which is a gradual increase of 3-phase load from a normal value to twice normal. The increase occurs over a period of several seconds and lasts from 5 to 10 sec before decreasing gradually to a normal value. This change was recorded while operating at 470 and 510 v. The greatest variation of this type recorded was from 23,400-kva at 82% power factor to 66,000-kva at 51% power factor. This type of load swing need not be considered as a flicker problem but must be reckoned with in relaying, system ties, interconnections, and regulation equipment both on lines and generators.



CYCLIC FLICKER draws its portrait on this graph during operation on the 510-v tap. This flicker is objectionable



EXTREMELY FREQUENT FLICKER, shown by this graph, is most severe during first 15 min (30 min for cyclic type)

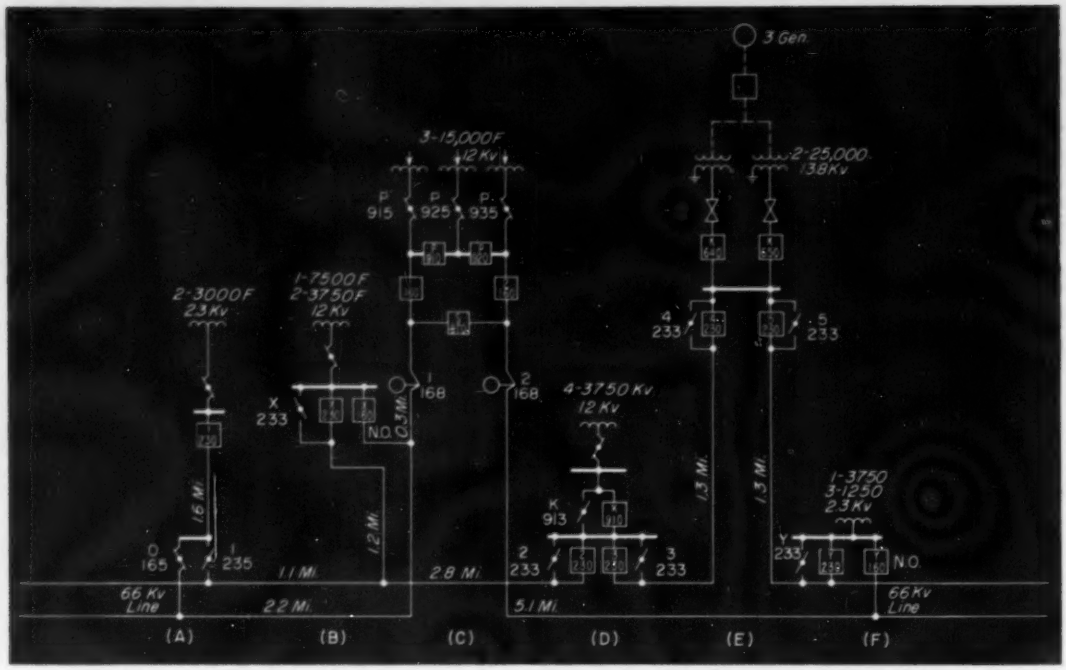


LOAD CHANGES over several seconds that last 5 to 10 sec are not flicker. But they affect relays and the system's ties

AIEE Prepares Arc Furnace Report

Readers who are concerned with arc furnace flicker may find especially interesting a new "Guide for Application of Arc Furnaces on Power Systems—Preliminary Report" prepared by the System Planning Subcommittee of the AIEE Committee on System Engineering. This paper was presented at the AIEE Fall General Meeting in Chicago, Oct. 3-7.

Based on data submitted by 18 companies concerning 246 separate arc furnace installations, this report establishes a preliminary direct correlation of transformer ratings for steel-melting furnaces (above 1,000 kva) and system impedance to the points where flicker is found and deemed objectionable. For copies of CP 55-802, write AIEE, 33 W 39th St, New York, N. Y.



SEVERAL TYPES of industrial substations are supplied from the 66-kv system as shown above: A, Manual change-over type; B and F, Automatic change-over type; C, D, and E, loop type. Service is supplied here via two 66-kv feeders

Faced with a variety of problems, Houston L&P learned . . .

How To Relay Industrial Loads

R. E. SYPERT, Electrical Engineer, Houston Lighting & Power Co, Houston, Texas

Sometimes it is hard for a power company to achieve satisfactory relay coordination at industrial substations. It encounters a variety of problems requiring special relay techniques.

Houston Lighting & Power Co has found through experience that better coordination often can be obtained if the utility's engineers figure out some of the relay settings for the industry's main substation.

It has also been found that periodic inspections and tests should be made on these relays and critical equipment in the substation. This practice, beneficial to the power company's operation, also has helped customers.

Briefly, here are some of the problems encountered by Houston L&P.

Some customers generate their own power and are served by a 66-kv line looped in and out of their plants. Some customers, served by taps from 66-kv lines, have equipment that causes excessive outages. Some customers are served from 66-kv lines with the 66-kv side of the transformer ungrounded. And there are other types of service to industrial customers. Each presents its own special relay problem.

A number of large industrial plants along the Houston Ship Channel are served by a 66-kv transmission line looped through their substations with oil circuit breakers and complete line relaying terminals on each section. The result is a transmission line composed of a number of short sections.

A few customers in this area, who require large quantities of steam in their process operations, generate a part of their power requirements incidentally to their production of process steam. Periods of both operation and non-operation of the customer's generation must be provided for in the relaying, which must be capable of correct operation and coordination at all times, regardless of the customer's generating schedule.

Such conditions create difficult problems in back-up relaying. Often relays must be set so they will not coordinate with an adjacent section. Under these conditions a substation is selected where a misoperation will not result in a substation outage.

Other industrial customers are served by a tap off a transmission line, either from a single circuit or with provisions for change-over from one circuit to another in case of trouble on the preferred circuit. With oil circuit breakers on the incoming taps, relaying is not too difficult except in some special cases.

When an excessive number of outages is caused by equipment within the customer's substation, the customer is sometimes required to install carrier blocking equipment. This equipment prevents the power company's carrier relaying from operating on faults of these types and allows time for industrial customer's protective equip-

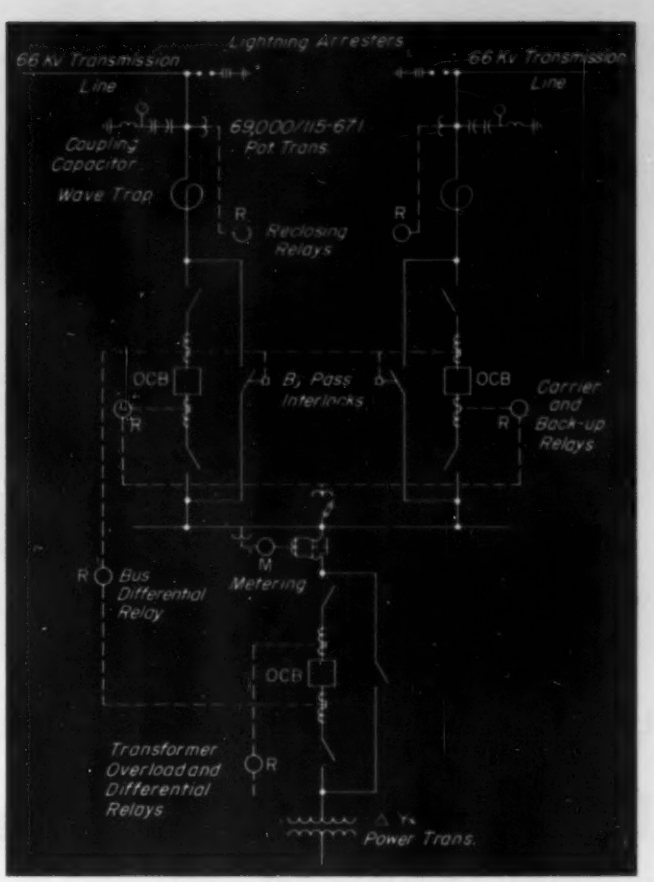
ment to clear the trouble. The reason for requiring such equipment is to protect service continuity to other customers tapped off of the same circuit.

Complex relaying problems arise where the customer has generation in his plant and the transformer tie with the power company is ungrounded on the 66-kv side. This leads to trouble in tripping the customer's plant off the line when a phase-to-ground fault occurs on the 66-kv system because there is no source of ground current with the ungrounded transformers. Although the customer's plant is not feeding into the fault, leaving the plant on the line is still undesirable because of voltage stresses across transformer windings.

Such a situation may be remedied by one of several methods, depending on conditions. If other customers are connected on the same line section, reverse power relays may be used because this customer's generation would attempt to supply the other loads.

If, however, there are no other loads on the particular line section then more elaborate relaying methods are required. Although the reverse power relays could possibly be set sensitive enough to operate on line and transformer charging currents, this would not be satisfactory because often, under normal conditions, the customer may operate with zero power interchange and may even feed into the power company's system. Then reverse power relays would trip.

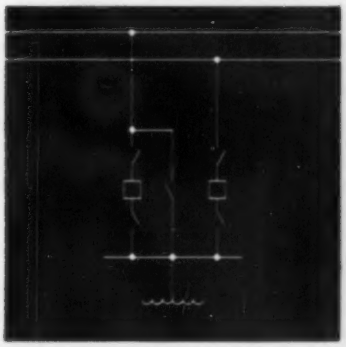
Remote tripping offers a solution to this problem. Use of grounded wye-connected power transformers would be a solution. However, they are not generally used because with a solidly grounded neutral system, such as the Houston Lighting & Power Co has, it would be difficult, if not impossible, to coordinate ground relays with many sources of ground current along the transmission lines.



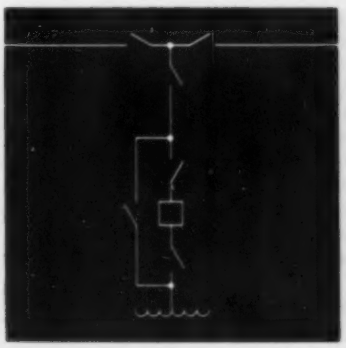
TYPICAL LOOP TYPE STATION GETS ITS POWER FROM TWO 66-KV LINES

High-speed reclosing is often not feasible because of generation within customers' stations and because of customers' large synchronous motors. Even for delayed reclosing the customer's station must be disconnected.

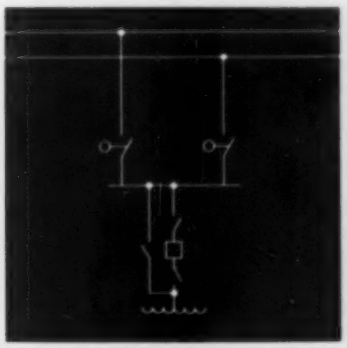
If the customer has generation, then one of the methods previously mentioned might be used. However, customers without generation but with large synchronous motors are often more of a problem because an expensive installation of relays may not be justified. By slowing down the reclosing on a line, such a customer can often be tripped off by underfrequency relays or by undervoltage relays having a time delay.



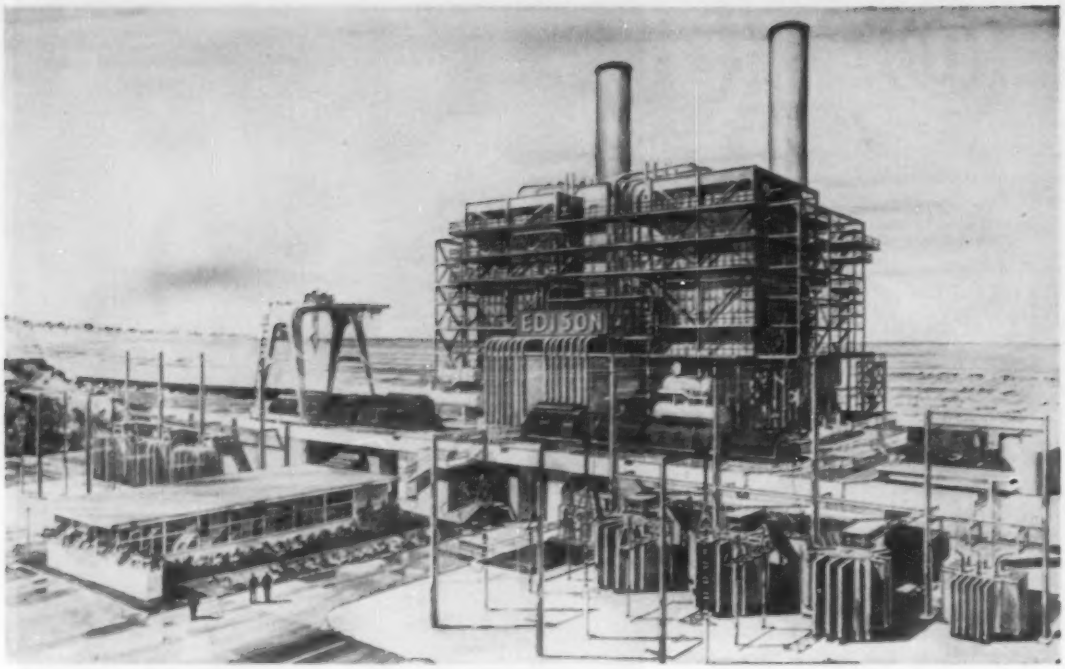
CHANGE-OVER from one 66-kv line to another can be done with oil breakers



SOME INDUSTRIAL SUBSTATIONS have a line tap flanked by two switches



MOTOR OPERATED air break switches speed changes in substations like this



Located on Pacific Ocean Near an Oil Refinery, El Segundo Station . . .

Burns Most Viscous Fuel Ever Used

GENERATION
Design

Clean lines and imaginative color scheme provide attractive appearance. Outdoor design is used, despite oceanside location

By spotting its new 312,500-kw El Segundo Station next door to a refinery, Southern California Edison Co will be able to burn the highest viscosity oil ever proposed for use in quantity as a fuel by a utility company. However, the only suitable next-door site resulted in locating the station seaward of the refinery just a few hundred feet from the surf line of the Pacific Ocean. Another complication, the necessary re-routing of a major public highway, literally puts the new plant at highway side. Thus a special effort was made to develop an attractive architectural design.

Coupled with these conditions was the desire to build economies of construction and operation into the plant. El Segundo is an outdoor plant built for two units ultimately. Its estimated cost is $135 per kw of guaranteed capability. Expected net heat rate is 9,440 Btu per kwhr. When the second unit is on the line, the 312,500-kw station will require a five-man operating crew.

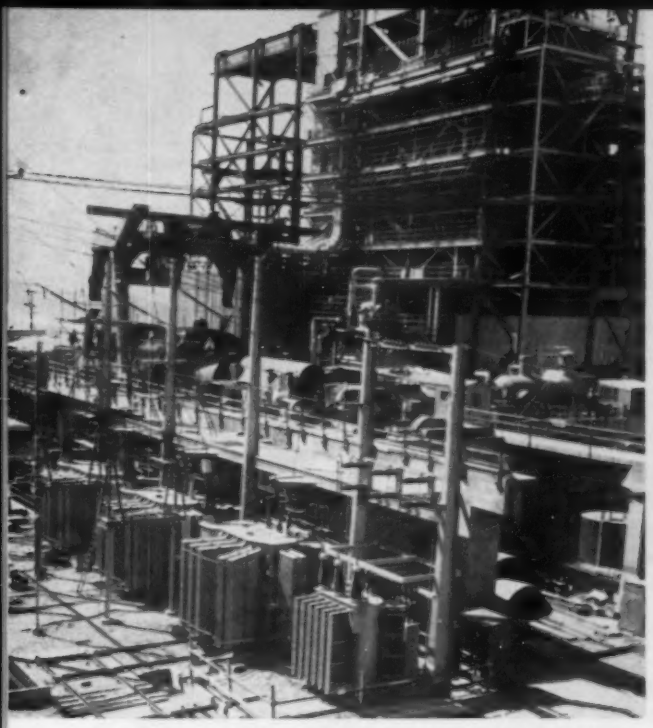
The refinery residual oil which will be used initially for fuel has a viscosity of 1,500 SSF/210 F. It will be delivered to the burners at about 370 F. Higher viscosity fuels differ from commonly used Bunker C oil only in that they contain somewhat less volatile material and so are maintained in fluid state only at higher temperatures.

Fuels are expected to have an average heat content of about 6.5 million Btu per barrel. At the higher burner temperatures to be used, fuel viscosity will be that of Bunker C oil at normal burner temperature. Therefore, no particular burner difficulties are expected, and combustion will be as complete as with less viscous fuels.

Principal delivery of the heavy fuel oil will be directly from refinery stills. Thus the problems connected with storing large quantities of viscous fuel on the station grounds will be eliminated. Two 30,000-bbl insulated, supplementary storage and metering tanks at the plant site will insure an even flow of fuel. All main fuel oil lines will be steam traced. Fuel supply protection is provided by an alternative source of Bunker C oil to the station.

Problems involved in transporting oil which is solid at ambient temperatures necessitated locating the station near the supply source. The only available site affording both proximity to the refinery and access to the ocean for cooling water was a comparatively narrow strip along the ocean front. Here an area of 22.5 acres was obtained by re-routing a section of highway which generally parallels the beach.

The coast at the El Segundo site normally gets important storm protection from the Santa Barbara Channel Islands, except for a narrow angle of azimuth which is open to the sea. The



OUTDOOR OPERATING DECK is at same level as the boiler firing aisles. Condensers, exciters, and most of the auxiliaries are below turbine deck in partially enclosed area

ATTRACTIVENESS OF DESIGN is enhanced by use of aluminum coverings over main steam lines. The station uses a color scheme that blends or contrasts with ocean background

surf is normally light. To assure against high water at the station during unusual storms, finish grade is about 13 ft above maximum high tide. A well anchored sheet pile and Cyclopean masonry seawall is provided to 23 ft above the highest tide.

Because El Segundo commands the view from the re-routed public highway, an attractive appearance was considered important. For its external design, the station has clean, well-proportioned lines coupled with imaginative colors which will blend or contrast with the ocean background.

El Segundo is of outdoor design, but considerable protection from the effects of salt spray is obtained by setting the boilers with their backs to the sea. The full side toward the sea below turbine deck is then walled in with concrete blocks. Most station auxiliaries, including the condensers and exciters, are beneath the turbine deck and hence partially enclosed.

Above the turbine deck only the control room and elevator shaft will be enclosed. High quality protective paints carefully applied to all exposed equipment and structural steel are expected to minimize maintenance costs. Non-corrosive materials and marine-type fittings are used for some equipment in severely exposed locations. Despite the proximity to the ocean, the reliability should be as high and the maintenance costs no greater for El Segundo than for a similar station at an inland site.

Soil conditions at the site allowed use of spread-foot foundations for major structures, thus eliminating costly piling. All structures are designed to withstand a horizontal seismic force of 0.2 g.

Reheat Boilers Are Used

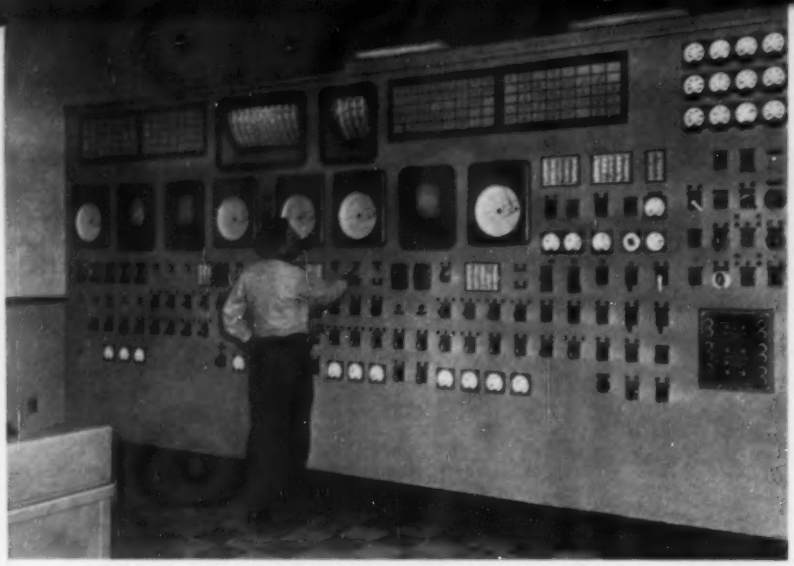
Steam generators are radiant, natural circulation boilers each rated for 1,140,000 lb of steam per hour at 1,800 psig and 1,000F with a reheat temperature of 1,000F. Each furnace has a total volume of 83,000 cu ft. Forced gas recirculation, with a single 300-hp fan for each boiler, and desuperheaters provide for temperature control.

Each boiler has at ground level two 600-hp forced-draft and two 700-hp induced-draft constant-speed fans with vane controls. Fuel is fed into each furnace through 16 retractable gun-type burners. There are two 2,500-hp boiler feed pumps per boiler and one station spare, each unit having a capacity of 750,000 lb/hr.

Turbines are 3,600-rpm, single-shaft, tandem-compound, triple-flow units with seven stages of extraction. Following a practice used successfully by Southern California Edison, open deaerating fifth point heaters are mounted on the turbine deck, with all other feedwater heaters below the turbine level. Evaporators are mounted on the turbine deck. Net heat rate at full load is expected to be about 9,440 Btu per kwhr. Stop valves are provided in the main and reheat steam lines, with intercept valves in the reheat sections.

Main condensers are horizontal two-pass type with divided water boxes and 90,000 sq ft of surface. A 100-hp dry-vacuum pump on each unit permits rapid evacuation of steam spaces during startup and acts as automatic backup of the single set of steam-air ejectors. Cooling water system consists of two 10-ft diameter tunnels which extend into the ocean and terminate in vertical structures with intakes at elevation minus 20. Precast reinforced concrete sections for the tunnels have self-centering, bell and spigot, all-concrete joints to eliminate metallic joints and attendant corrosion problems.

Normal intake tunnel extends 2,600



GROUPED FOR CONVENIENCE are instruments and controls for each main unit. All indications are telemetered electrically or pneumatically into control room

ft offshore and the discharge tunnel 2,100 ft. Stainless-steel butterfly valves will allow reversal of the flow of water periodically to remove marine growths in the intake tunnel by thermal shock. This method of control has been used successfully at other company steam stations using sea water for cooling. Two 500-hp vertical shaft circulating water pumps are provided for each condenser.

Generator Voltage is 18 kv

Main generators are rated 18 kv, 147,059 kva at 0.5 psig hydrogen pressure, and 183,824 kva at 30 psig. They are Y-connected, with neutrals grounded through a potential transformer for alarm indications only. Generator and transformer protection is afforded by differential relay systems. Annunciator alarms will sound should winding temperatures become excessively high. Motor-driven exciters for each unit are controlled by rotating amplifier-type voltage regulators. A spare exciter and voltage regulator are provided.

Each main generator connects directly to an 18/220-kv transformer bank through isolated-phase buswork beneath the turbine deck and open-screened bus beyond the edge of the deck. Each bank consists of three 56,000-kva, single-phase, self-cooled transformers with high voltage windings having an 825-kv BIL. Lightning arresters connect through disconnect switches to the high side of the transformers.

Overhead leads run from the transformers to the 220-kv switchyard where the two units and two transmission lines are arranged in a ring bus. Windbreak panels on the seaward side of the switchyard will minimize insulator contamination from wind-borne salt spray. One line terminates at La Fresa Substation and the other at Lighthipe Substation. These lines have 1,033 MCM ACSR conductors, which will be grease-filled in sections near the coast.

Normally, auxiliaries of each unit are powered from shaft-driven, air-cooled auxiliary 12,500-kva, 4.16-kv generators. These auxiliary generators were selected as economical, efficient power sources which will be unaffected by system voltage disturbances. They also are Y-connected with neutrals grounded through potential transformers for ground indications.

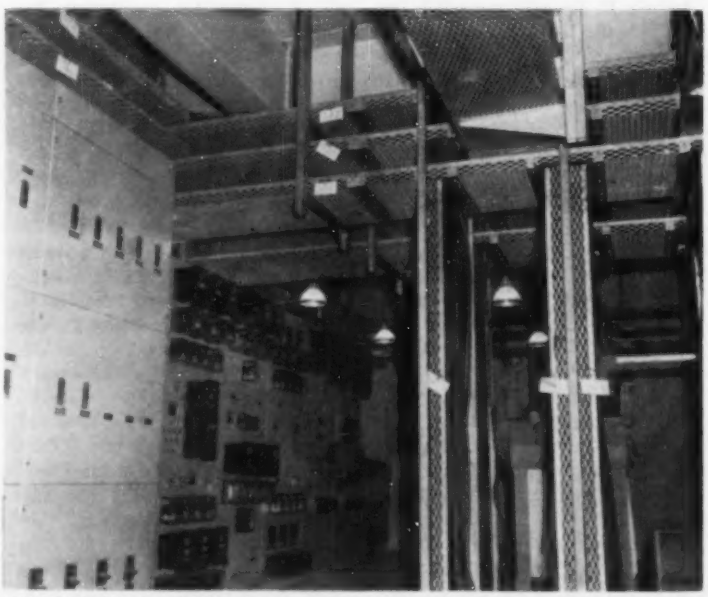
Motor-driven exciters with quick-response regulators are used on the auxiliary generators. Differential and overcurrent relays will provide protection. Operation of the differential protection on the main generator will automatically transfer load from the auxiliary generator. This transfer of load also may be made either automatically by undervoltage relays or manually.

For start-up and reserve power, a 10,000-kva, 69/4.16-kv, 3-phase transformer energized from an outside 69-kv transmission line is provided.

All auxiliary motors of more than 300 hp are supplied at 4.16 kv; smaller motors are carried on the 480-v supply. All exposed motors are of the weather-protected type and have heaters. Metal-clad, air-circuit-breaker switchgear is used on both auxiliary systems. Most smaller 480-v motors are fed from motor-control centers.

Cable trays are used at El Segundo wherever practical to minimize the use of conduit. A cable-spreading

(*Continued on page* 137)



CABLE SPREADING ROOM shows use made of cable trays to minimize conduit runs. This room also houses relays for electrical equipment and transmission lines

100,000-kw addition at Urquhart Station boosts South Carolina E&G's capacity 20%

Highlighting a sweeping expansion program by another of America's farsighted electric utilities is South Carolina Electric & Gas Company's completion of a third General Electric turbine-generator installation, a 100,000-kw unit, at the Urquhart steam station. Full-time operation of this unit will represent a 20% increase in S.C.E. & G.'s total system capacity. Urquhart Station was built by South Carolina Generating Company, a wholly owned subsidiary.

When the utility and its engineers and constructors, Gilbert Associates, selected General Electric equipment, a fully integrated team of G-E engineers was assigned to the project. Their work in cooperation with S.C.E.&G. and Gilbert helped achieve on-time start-up, low installed cost of the new unit per kw.

GENERAL ELECTRIC

For more station data see next page ▶

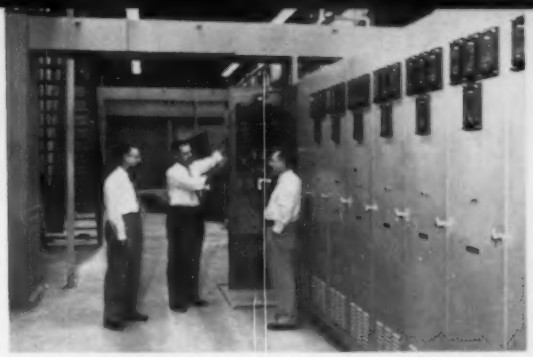
PROJECT SERVICES REPORT:

ADVANCE DESIGN, precision manufacturing, and careful supervision of installation of this 100,000-kw G-E turbine-generator helped make South Carolina Electric & Gas Company's Urquhart Station one of the most efficient in Southeast as noted by S.C.E. & G.'s J. F. Rader and N. D. Urquhart and G.E.'s J. M. McDonald.

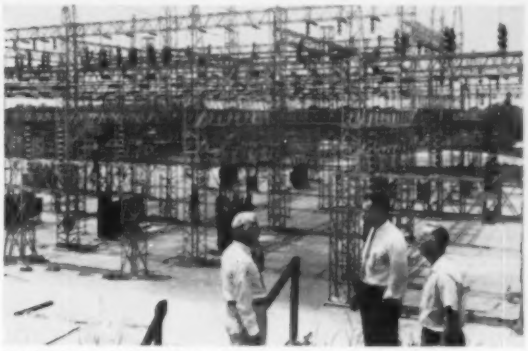
G-E team helps S.C.E.&G., Gilbert Associates

COMPACT DESIGN of control switchboard permits flexible control of equipment as viewed by S.C.E. & G. Vice Pres. F. R. McMeekin, N. D. Urquhart and G.E.'s J. M. McDonald.

TOP RELIABILITY of G-E fan drive motor is discussed by General Electric's J. M. McDonald and George L. Dibble of South Carolina Electric & Gas Company.



GREATER PROTECTION is assured by main metal-clad switchgear. Connections are being inspected by G.E.'s J. M. McDonald and R. R. Smith and S.C.E. & G.'s G. L. Dibble.



FUNCTIONAL LAYOUT of the switchyard including main breaker is viewed by J. F. Rader of S.C.E. & G., G.E.'s R. R. Smith, and H. J. Turner, Urquhart Station Supt.

LONGER LIFE of giant G-E power transformer is provided by latest cooling advances noted here by S.C.E. & G.'s H. J. Turner and G.E.'s G. Zoret and L. A. Coone.

install apparatus, hasten start-up time

Project team helps train station's operators to assure utility of better understanding of equipment's full capabilities

With General Electric's project team on the job during construction of the multi-million dollar expansion of the Urquhart steam plant, vital services were performed to keep the project's progress running smoothly. One of these services was close assistance in supervising the installation of all electrical apparatus. As a result, S.C.E. & G. and Gilbert Associates were assured that each item of equipment was in position and all connections checked to help speed initial start-up.

Further valuable help was the work of G-E engineers in training the Urquhart station's operators. This service meant that the utility's personnel would understand and wherever necessary be able to take full advantage of the operating capabilities of each item of electrical equipment.

For example, even before start-up time, the G-E installation supervisor was providing guidance to the men who would soon operate the new turbine-generator. During start-up, the operators "learned by doing" under the counsel of the G-E start-up engineer. After the unit was in commercial operation, the start-up engineer gave additional instruction to the S.C.E. & G. operators for assurance that the unit's operational features were fully understood.

G-E PROJECT SERVICES . . .

Simplify Ordering of Equipment purchased either directly or through your consulting engineers, or through a machinery manufacturer.

Conserve Engineering Time by assisting with electrical equipment details, thereby freeing you and your consulting engineers for other urgent problems.

Integrate Equipment Design with consultant's plant design to assure the maximum flexibility and effectiveness of operation.

Speed Construction by scheduling the arrival and disposition of equipment for maximum installation efficiency and on-time start-up.

Assist in Training Operators to better understand the full operating capabilities of the equipment.

For details, contact your General Electric Apparatus Sales Representative or write Section 302-10, General Electric Company, Schenectady 5, New York.

MORE POWER TO AMERICA

GENERAL ELECTRIC

LATEST EQUIPMENT DESIGNS help electric utility handle present and future loads. Designs reflect new ideas from the field, incorporate most recent product advances.

INSTALLATION OF ELECTRICAL equipment for Urquhart expansion is discussed here by G.E.'s J. M. McDonald, Gilbert Associates' J. E. Kowalsky, S.C.E. & G.'s F. R. McMeekin, G.E.'s L. A. Coone, Installation Supervisor, and S.C.E. & G.'s Chief Construction Engineer N. D. Urquhart.

TOP OPERATING FLEXIBILITY will aid in improving system efficiency. S.C.E. & G.'s F. R. McMeekin, J. F. Rader and W. A. Brumsey discuss panel board with G.E.'s M. O. Troy.

How G-E application engineering helps utilities obtain apparatus to fit today's exacting needs

Electric utilities and their consultants designing a steam station have found that it pays to capitalize on the knowledge of the General Electric application engineer. In the early planning stages of a project, this G-E engineer can offer valuable assistance in the selection of the type of apparatus needed. Later, he will help in engineering this equipment into a complete operating system. In addition, this specialist takes into consideration the present *and future* requirements of the utility to assure a maximum return for each dollar invested.

Application engineering is just one of many Project Services on your job when you or your consultant selects G-E equipment. You take advantage of all these services with G.E.:

Application Engineering helps assure all electrical equipment is coordinated in design and operation to best suit the requirements of your plant.

Product Development Engineering means equipment design which reflects both field experience and laboratory achievements.

Installation Supervision means competent direction of installation, planned start-up and training of operators to help assure proper operation of equipment.

Service Engineering helps keep plant operating at full capacity and maximum efficiency, and provides guidance in setting up and carrying out of maintenance programs.

Project Coordination helps assure proper selection, design, manufacture, delivery of your equipment without costly delays at installation time.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Loss Compensators Reduce Metering Costs

METERING Operation

VEPCO's 47 installations on load side of substations measure transformer, line losses economically for inclusion in billing

W. C. HARRISON, System Meter Supervisor, Virginia Electric & Power Co, Richmond, Va.

Loss compensating metering has been used by Virginia Electric & Power Co for the past six years with excellent results. A total of 47 such installations have been made on the load side of substations to measure losses of either transformers or lines or both for inclusion in the regular billing.

Use of the loss compensators provides substantial savings where the high-side voltage is 33 kv and above because of less-expensive instrument transformers. Moreover, other savings may result from elimination of additional lightning protection, extra grounding, structure changes, and even fencing. Good grounding at the customer's substation reduces damage from lightning and hazards to personnel.

Useful in Rural Areas

Vepco has found that compensating for losses is principally applicable in rural areas where certain industries and co-ops that own substations are served at primary voltages. Normally these customers would be metered at 33 kv or higher. However, economic considerations influenced the use of low-side metering with compensators for determining losses.

Two types of compensators are available for measuring either transformer or line losses or both, when properly calibrated. One is a special meter and compensator that records only losses. Its reading must be added to that of the main service meter. The other compensator can be applied to the main service meter to add in losses directly. Exhaustive tests have proved that both methods will give the same excellent results within acceptable limits.

In the beginning Vepco used the separate meter, so that unforeseen errors or trouble would not influence the main billing. Adjustments would then only involve the loss meter's registration, which is less than 2% of total energy consumption in most cases. Energy recorded on the loss meter is added to that recorded on the main billing meter. No demand register is used because it is, of course, not possible to add demands.

Calibration Simple

Where demands created by the transformer losses are considered in billing, suitable loss curves are prepared from manufacturers' test data for each transformer. And from these curves are read the kilowatts to be added to the maximum demand shown on the regular meter.

This curve is usually approved by the customer himself some time before the first billing.

Calibration of such meters is fairly simple, from data supplied by the transformer manufacturer. The register constant can be selected for ease in billing. Vepco selects most registers for multipliers of 10 and a few for a multiplier of one.

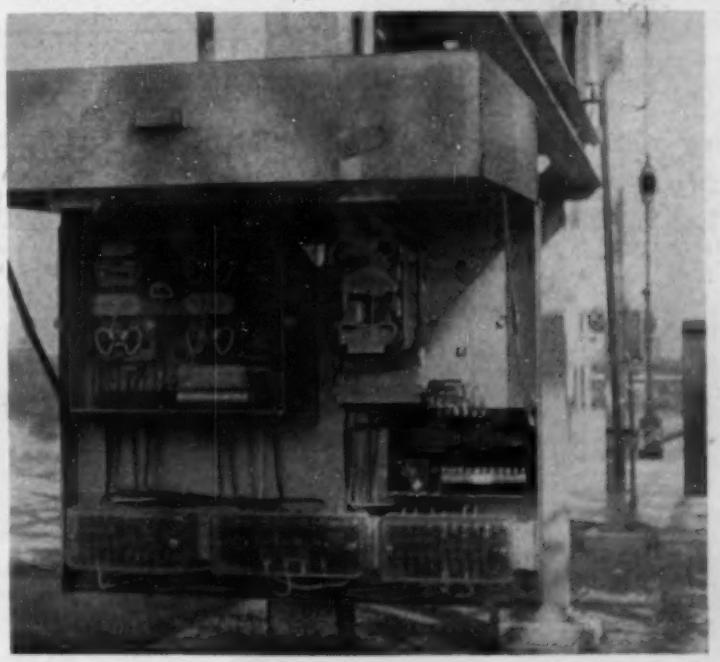
During the past six years loss meters have had an excellent service record. Not a single case of meter failure has been noted, and good accuracies between annual test periods have been maintained.

Presently in service are two installations of loss meters at 110—33 kv substations, six at 110—7.2 kv, one at 110—2.4 kv, 13 at 66—7.2 kv, four at 44—7.2 kv, 20 at 33—7.2 kv, and one at 22—7.2 kv.

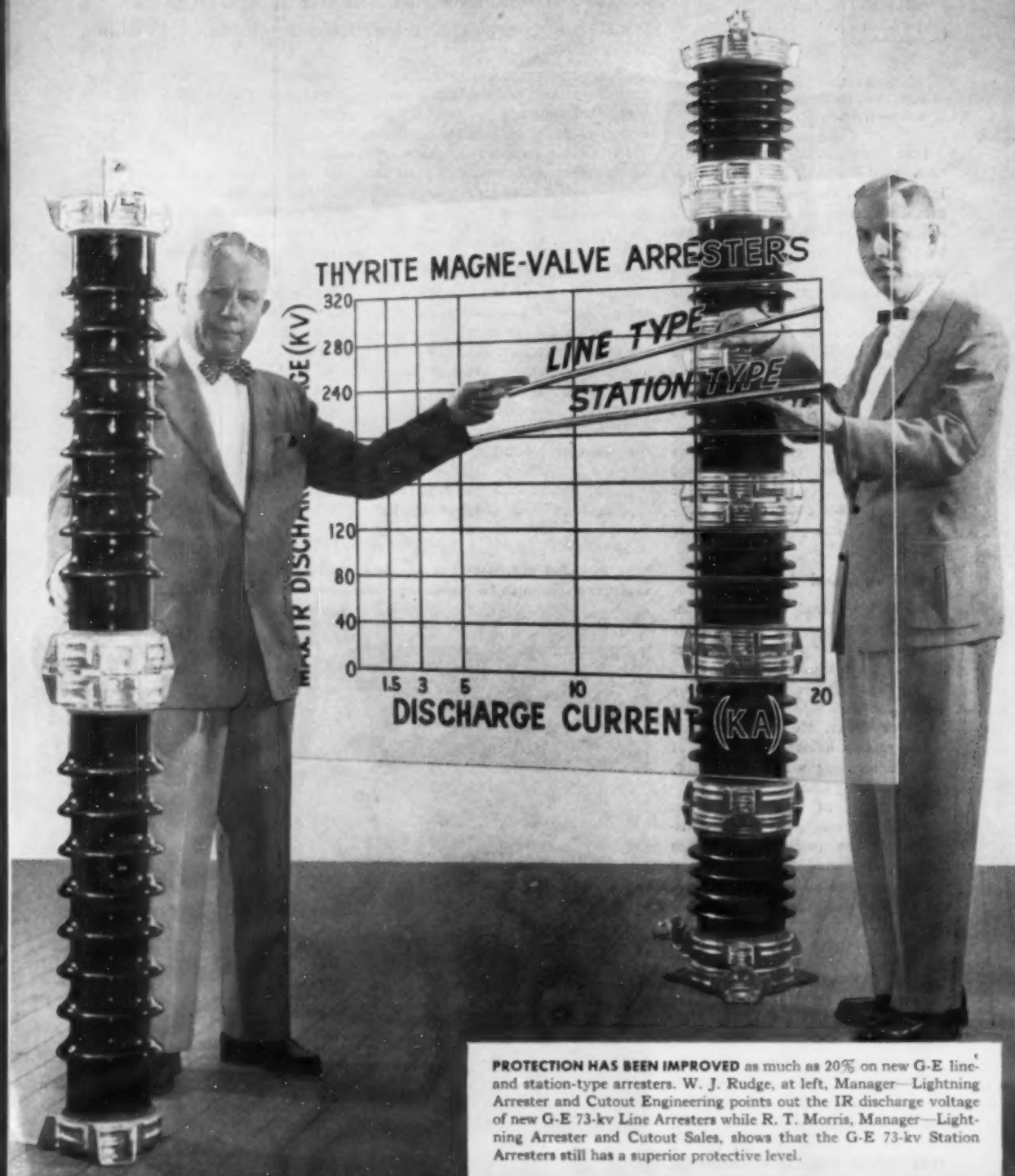
In addition to these applications, loss compensators are installed on two major tie lines, connecting Vepco with neighboring utilities, to record line losses.

(*More How To on page* 82)

COMPENSATED EQUIPMENT is connected to low-voltage side of primary-rate customer's substation for measuring transformer losses and/or line losses



G.E. appraises a tough question on lightning arresters . . .



PROTECTION HAS BEEN IMPROVED as much as 20% on new G-E line- and station-type arresters. W. J. Rudge, at left, Manager—Lightning Arrester and Cutout Engineering points out the IR discharge voltage of new G-E 73-kv Line Arresters while R. T. Morris, Manager—Lightning Arrester and Cutout Sales, shows that the G-E 73-kv Station Arresters still has a superior protective level.

LINE OR STATION... WHICH SHOULD YOU CHOOSE?

Which is better for your application, line or station arresters? Now that General Electric has made major design improvements in both types, the right answer to this question gains new importance.

THE CHOICE IS YOURS. G.E. makes both types. Although there isn't any black-and-white solution that can be applied everywhere, there are some clear-cut applications for each, depending upon the economics and engineering involved.

SUGGESTED APPLICATION GUIDE. To help you strike a balance between the best degree of lightning protection and the lowest possible cost, General Electric makes these suggestions.

G-E Station-type arresters are generally preferred for:

1. Locations where size and importance of apparatus demand the best in protection for uninterrupted service-continuity.
2. Transformers or other apparatus having reduced insulation and rotating a-c machines, 2400 volts and above.
3. High-voltage lines subject to severe switching surges.
4. Cable systems or large KVAR capacitor banks that require maximum arrester discharge capacity.
5. Transformers in severe lightning localities or connected to lines with no overhead ground wire, or highly insulated wood pole lines, or locations where close arrester coupling is not possible.

G-E Line-type arresters are generally preferred for:

1. The protection of smaller or what is considered less important apparatus.
2. Locations where space requirements for station arresters are not available, for example, certain metal-clad equipments and mobile substations.
3. Protection of switching substations containing breakers, air-break switches, etc.
4. Protection of low voltage side of transformer substations, where line-type arresters are already used on high voltage side.

WHICHEVER YOU CHOOSE, line or station, remember that now you get as much as *20% more protection* in both types. The reason—a design combination of improved Thyrite valve disks and exclusive Magne-Valve series-gap.

NEED MORE HELP? The data chart below shows you the comparative characteristics of G.E.'s new station-type and line-type arresters. An application engineer from your local G-E Sales Office will be glad to assist you. Or write to General Electric Company, Schenectady 5, New York—ask for Bulletin GEA-1304 (Station Arresters) or Bulletin GEA-2978 (Line Arresters). 431-14

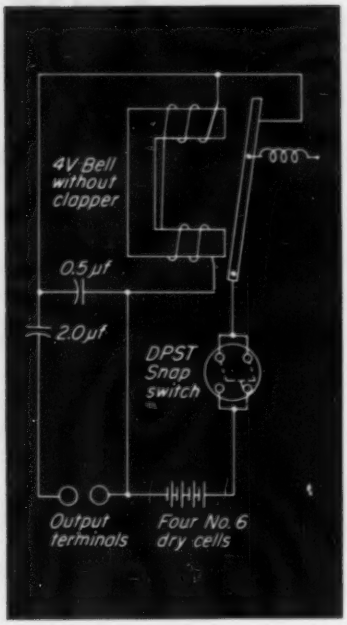
COMPARATIVE DATA

THYRITE® MAGNE-VALVE	STATION-TYPE	LINE-TYPE
DISCHARGE CAPACITY		
HIGH CURRENT 5 X 10 μs wave, 2 discharges	150,000 A	100,000 A
LONG DURATION 2000 μs rectangular wave, 20 discharges	650 A	200 A
DUTY CYCLE (10 X 20 μs wave initiating impulses, 20 operations, full rated voltage during flow of follow current)	20,000 A	10,000 A
RELATIVE VOLTAGE STRESS ON PROTECTED APPARATUS	100%	120%*

*(Average—Exact Ratio Depends on Discharge Current) ® Registered Trade-mark G.E. Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC



Tracer-current generator connected to tower structure sends signal out on buried wire that is detected with a portable pick-up loop by trouble-shooter

Speeds Locating Breaks in Counterpoise

Simple battery-powered tracer-current generator with pick-up loop gives faster test for trouble on buried bare conductors

S. K. WALDORF, Former Engineer of Research, Pennsylvania Water & Power Co, Lancaster, Pa.

A simple tracer-current generator has been devised for use with a pick-up loop to locate breaks in counterpoises and other buried bare conductors. Because the generator is battery powered, considerable time and energy are saved over the former method of employing a ground resistance tester for this purpose.

Heart of the high-output generator is a 4-v, industrial bell with its clapper and gong removed that is powered by four No. 6 dry cells. The bell winding is shunted with a ½-microfarad capacitor to minimize sparking at the bell's interrupter contact. A 2-microfarad capacitor in series with one of the output terminals prevents excessive battery current when a low resistance is connected to the terminals.

A DPST snap switch, with contacts connected in parallel, is provided to increase reliability of the generator. Battery drain is approximately ¼ amp, permitting a relatively long battery life.

Generator Parts Boxed

Components for the generator are in a wooden box, and the bell is mounted on foam rubber. The rubber reduces air-borne buzzer noise to a point where it does not interfere with the signal received.

The pick-up loop consists of a coil connected to a 75-ohm, watch-case telephone receiver. The coil was made by winding 175 turns of No. 23 enameled wire on a wooden bicycle wheel rim, which has a diameter of about 25 in.

For locating breaks, the generator is connected between the tower structure and counterpoise. In cases where the end of conductor is some distance from a structure, one or more ground rods may replace the structure.

After the tracer-current generator is started, a testman proceeds from that location following the plane of the coil. Swinging the coil slightly from side to side over the buried conductor insures that the coil is aligned for maximum response.

When the received signal disappears, the testman is about 5 ft from the break. Conductors as long as 1,000 ft have been traced satisfactorily with this equipment.

SAVE
ON YOUR REACTOR COSTS

10% by ordering aluminum conductor
8% more by ordering standard ratings

ALUMINUM CONDUCTOR IS NOW STANDARD on G-E cast-in-concrete current limiting reactors. Savings from the use of aluminum are being passed on to users. Aluminum has been adopted as standard because it is preferred by most utilities. Copper conductor reactors can still be furnished when desired, at a 10% higher price.

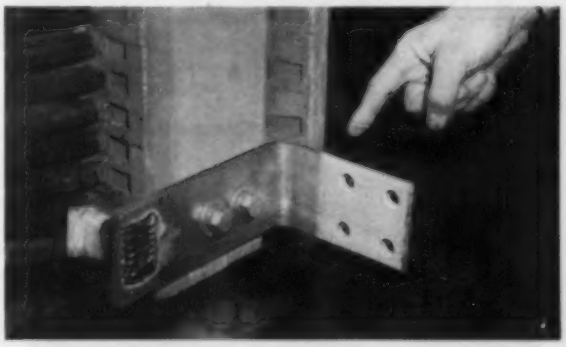
STANDARD RATINGS SAVE YOU MORE MONEY AND 2 TO 3 WEEKS ON SHIPMENT
A new RM (Repetitive Manufacture) program of standard reactor designs enables you to save an additional 8%. Stocked parts and streamlined manufacturing techniques also result in deliveries 2 to 3 weeks faster.

All standard ratings have aluminum conductor. They represent the ratings most often ordered, and include indoor and outdoor designs, single- or three-phase, for use on 4160-, 7200-, or 14,400-volt circuits. Ratings range from 100 to 700 amperes and from .10 to 2.5 ohms.

NEW ALUMINUM/COPPER TERMINAL—The standard terminal for aluminum conductor reactors is an aluminum alloy blade. However, for connection to copper bus, the aluminum terminal can be provided with a silver-plated copper end. A recently perfected technique of butt-welding aluminum to copper has made this new terminal possible. The weld is exceptionally strong, and is designed to withstand the severe stresses imposed by high current surges.

Take advantage now of these savings in reactor costs. For further information, see your G-E Apparatus Sales Engineer, or write for Bulletin GEA-6313, to Section 422-22, General Electric Co., Schenectady 5, N. Y.

BEN MONK, Manager of Transformer Apparatus Sales, points out how you can take advantage of these savings by buying aluminum-conductor reactors with standard ratings.



THE STANDARD ALUMINUM TERMINAL can be provided with a silver-plated copper end for connection to copper bus.

CONSIDERING ALL FACTORS YOU'LL WANT G-E REACTORS

GENERAL ELECTRIC

STEEL PANEL inside of dump body (arrow) protects top of body from chips discharged at high velocity by chipper

DUMPING a load of chips can be done by one man in one-and-a-half to two minutes. Tail gate of body is removable

Tree-Trimming Truck Hauls Chips, Tools, and Men

FRANK E. GRAHAM, Supv of Line Clearing, Alabama Power Co, Birmingham, Ala.

A dump truck with tool and crew compartments has been developed by Alabama Power Co for use with a chipper to reduce tree trimming costs. The special truck combines the functions of a dump truck for hauling chips and an equipment and personnel carrier in one compact unit. The additional cost of the truck over a conventional one is expected to be regained in 13 months through increased crew efficiency.

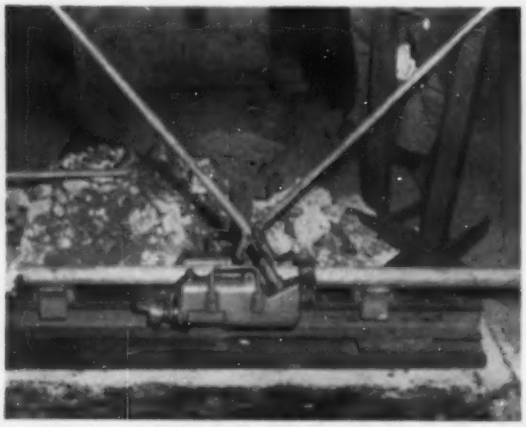
The special rig, costing $6,900 including chassis, was built on a two-ton truck chassis and has a dump body that holds 10 cu yd of chips. During normal operations the dump body will only have to be emptied once or twice a day.

On each side of the truck, independent of the dump body, are lockers for storing pole pruners, ropes, saddles, saws, axes, small tools, paint, and other equipment used by line-clearing crews. Behind the driver's cab is a five-man crew cab. Both cabs are heated electrically.

Two power take-offs are installed on the truck. One take-off is used to operate the lift under the dump body, while the other provides power for a front-end winch. The winch is used to remove large trees and to drag trees and brush from easements out to roads or streets. Moreover, the winch saves considerable time by pulling the trunk across terrain that does not provide sufficient traction for the wheels.

In addition to the dump truck each ten-man line-clearing crew is equipped with a chipper and a pick-up truck which carries a two-man power saw. This equipment can be split in two units when it's desirable to send three men with a pick-up for minor jobs.

The dump truck was designed jointly by the author and J. L. Wells, Superintendent of Automotive Transportation. It was built by a local truck-equipment company.



HYDRAULIC PIPE PUSHER set in a short trench shoves 2-in. conduit through the ground to a small hole 73 ft distant

DISTRIBUTION—Construction

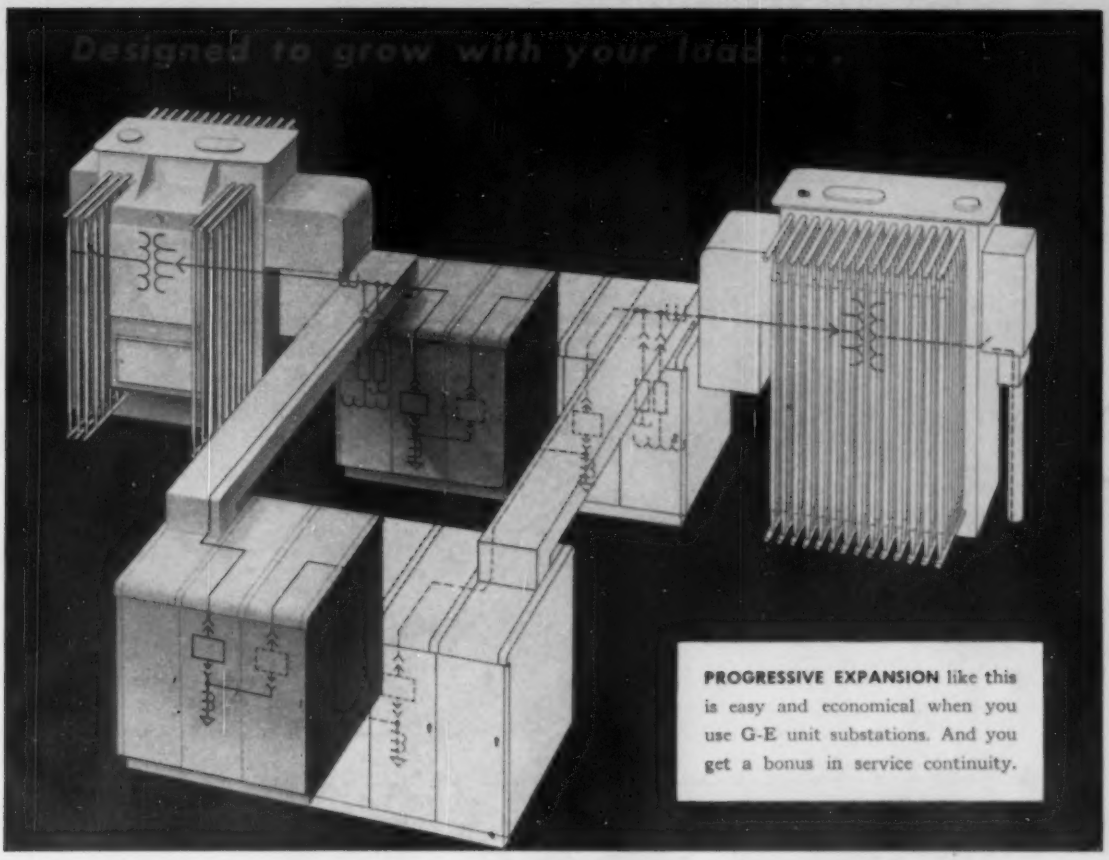
Pushing UG Conduit Saves $6/Ft on Single-Duct Runs

PAUL A. SKAFF, District Electrical Engineer, Appalachian Electric Power Co, Charleston, W. Va.

Pushing conduit through the ground instead of excavating and closing trenches saves Appalachian Electric Power Co both time and money. Moreover, congestion of both vehicular and pedestrian traffic is minimized by the use of a pipe pusher, which is particularly applicable for one and two-duct installations.

In the pushing method, a short trench is dug at one end of the proposed duct run and a small hole at the other end. A hydraulic pusher on a permanent mount,

(*Continued on page* 90)



PROGRESSIVE EXPANSION like this is easy and economical when you use G-E unit substations. And you get a bonus in service continuity.

This G-E unit substation expands easily from radial to double-duplex hook-up

Circuit arrangement permits:

- **Lower equipment cost in initial and final installations**
- **Expansion to double-duplex without shutdown**
- **High degree of service continuity**
- **Bus regulation for each pair of feeders**
- **All switching performed by adequate circuit breakers**
- **Routine inspection and maintenance can be made without dropping load**

To meet growing loads, this General Electric two-feeder unit substation can be easily expanded into a double-duplex arrangement—a four-feeder substation that combines flexibility and service continuity with relatively low equipment cost. And this expansion is possible *without shutting down the substation.*

The double-duplex arrangement has the recognized advantages of the familiar "breaker-and-a-half" scheme at low cost per kva. The two normally open tie breakers with automatic throwover provide a high degree of service continuity. It is possible to remove either transformer or any breaker from service without dropping load. All switching operations involved are performed by adequate circuit breakers. Automatic-load-tap-changing equipment on each transformer provides bus regulation for each pair of feeders.

For more information about double-duplex, or other G-E unit substations designed to meet growing loads, ask your G-E apparatus representative for bulletins GEA-3800 and GEA-5847, or write to General Electric Company, Section 512-9, Schenectady 5, N. Y.

GENERAL ELECTRIC

DISTRIBUTION
TRANSFORMERS
ATANA*

2. EASIER TO CHECK—
NEW HANDHOLE DESIGN

1. EASIER TO HANDLE—
BECAUSE THEY'RE LIGHTER

Picture story of a lineman making

BIG SAVINGS ON INSTALLATION

Time and money can be saved when installing distribution transformers. Ask the man who puts them on the pole! He'll tell you that General Electric transformers make his job easier in four ways.

Easier to handle. Lighter weight of G-E transformers means easier handling in warehouses, on trucks, and where it counts most—on the pole. Since 1937 G.E. has cut the weight of many ratings almost in half!

Easier to check. Only a screwdriver is needed to remove or tighten the single bolt which holds the one-piece cover band and the handhole cover. The nitrile rubber gaskets—another G-E exclusive—can be re-used again and again.

Handles copper or aluminum. No special fittings are needed because tin-plating of the terminals and built-in spring tension lick both the corrosion and the "cold-flow" problems of aluminum conductor.

More clearance, G.E. has shrunk sizes as well as weights. Lower heights mean big dollar savings because existing transformers can be replaced by larger ratings without changing poles. 431-21

*ATANA. Your lineman probably know better than anyone else that *All Transformers Are Not Alike.* General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

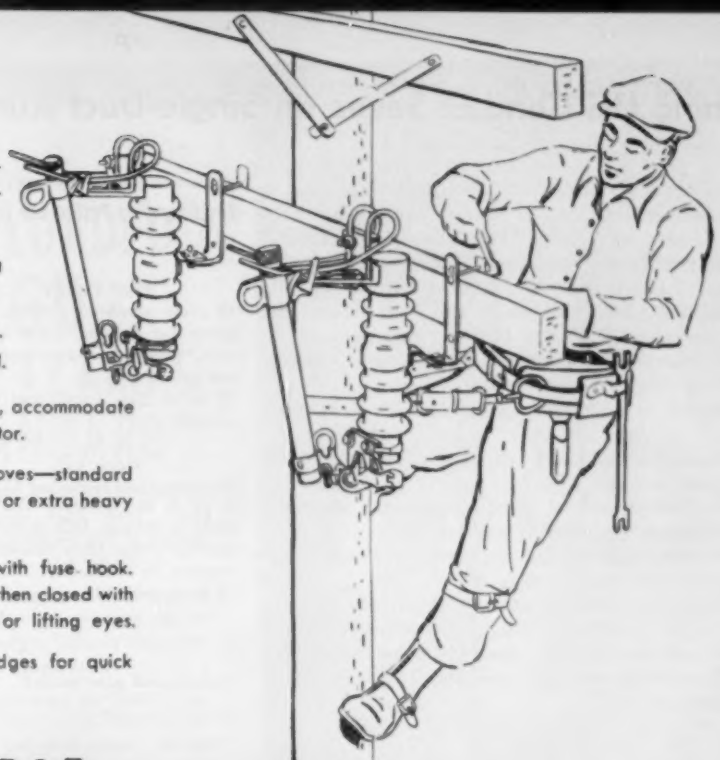
Table I—Properties of Plastic Insulations Without Fillers: Part 2

Data Supplied by Manufacturers

Trade Name		MYLAR	LUCITE	KEL-F	STYRON		ETHOCEL	SARAN
Type of Plastic for Classification		Polyester Film	Acrylic	Trifluoro-chloro-ethylene	Polystyrene		Ethyl-Cellulose	Polyvinyli-dene Chloride
Filler: (N) Not any		N	N	N	N	N	N	N
(E)xtruded, (C)ast, (F)ilm, (M)olded, (L)aminated		F	M	M & E	M	E	.....	M & E
Manufacturer's Grade or Number		1-Mil	HM-140	Unplasticized	666 Gen'l	700 Heat res.	.....	.....
Electrical Properties	ASTM Method							
Volume Resistivity, ohm-cm	D257	10^{17}	$>10^{15}$	1.2×10^{18}	$>10^{14}$	$>10^{16}$	.....	.....
Dielectric Strength, vpm, 1/8 in. thickness, short time test	D149	4,000	400	390	500	500	500	350
Dielectric Constant, 60 cps	D150	3.2	3.5	.....	2.5-2.6	2.5-2.6	3.1-4.2	4.5-6.0
10^3 cps	D150	3.1	3.8	.....	2.5-2.6	2.5-2.6	.....	.....
10^6 cps	D150	3.0	3.3	.....	2.5-2.6	2.5-2.6	3.0-3.4	3.0-4.0
Power Factor, 60 cps	D150	0.003	0.055	.....	0.002	0.001	0.004-0.016	0.03-0.045
10^3 cps	D150	0.005	0.040	.....	to	to	.....	.....
10^6 cps	D150	0.016	0.024	.....	0.005	0.003	0.015-0.052	0.045-0.065
Arc Resistance, sec	D495	.....	.....	>360	.....	.....	.....	.....
Mechanical Properties								
Specific Gravity	D792	1.38	1.18	2.1	1.05-1.07	1.05-1.07	1.1-1.17	1.65-1.72
Tensile Strength, psi: (s)tandard or (d)ry (approx 73F)	D638	23,500	10,600	4,600-5,700	6,000-7,000	7,000-8,000	3,000-6,000	3,000-5,000
Compressive Strength, psi	D695	.....	.....	32,000-80,000	12,000-16,000	.....	.....	.....
Impact Strength, ft-lb/in., 1/2 x 1/2-in. notched bar, Izod test	D256	.....	0.3	3.62	0.3-0.5	0.3-0.5	2.2-4.0	0.3-1.0
Hardness, Rockwell	D785	.....	M98	R111-115	.....	.....	.....	.....
Shore	D676	.....	.....	D80	70-72	68-70	.....	.....
Machining Qualities	.....	.....	.....	Excellent	Readily machinable		.....	.....
Thermal Properties								
Safe Operating Temperature, F	.....	300	.....	390	.....	.....	.....	.....
Flammability: (N)onflammable	D635	.....	1.8 in./min	N	1-2 in./min	1-2 in./min	1.0 in./min	S
(S)elf-extinguishing, or burning rate	D757	.....	.....	.....	.....	.....	.....	.....
Heat Distortion, 264 psi	D648	.....	187	.....	190-195	205-215	.....	.....
@ deg F. 66 psi	.....	.....	208	.....	.....	.....	.....	.....
Brittle Temperature, F	D746	−75	.....	.....	.....	.....	.....	.....
Chemical Properties								
Water Absorption, 24 hr, %	D570	0.5	0.3	0.00	0.07-0.08	0.07-0.08	1.0-1.4	<0.1
Resistance to Weathering	D795	.....	Excellent	Resistant to sunlight	Not recommended for outdoor use		.....	.....
Basic Color	.....	.....	Water white	Transparent Translucent	Clear	Clear	Extensive	Extensive
Light Transmission	.....	.....	Transparent >91	.....	88-90	88-90	.....	.....
Resistant to: (w)ater, (a)cids, al(k)alies, (s)alts, organic sol(v)ents, o(x)idizing compounds, (d)ilute acids, (h)ydrocarbons	.....	W D & K V, H	W, Weak A & K	W, A, K, S, V, X	W, A, K, S, X	W, A, K, S, X	K A fair to poor	A, K
Not Resistant to (list as above)	.....	Concen. A, K	Strong A & K Aromatic hydrocarbons	.....	V	V	.....	.....
Uses	.....	Motor & transformer insulation, Wire insulation, Tape, Capacitors	Lighting fixtures	Tube sockets, Sheet, Tubing, Rod insulation, Wire Coating, Mechanical Molding	Battery cases, Light diffusers, Radio cabinets		Industrial applications	Pipe, tubing, Fabric & screening films
Manufacturer	.....	E. I. duPont de Nemours & Co, Inc — Concluded		M. W. Kellogg Co	Dow Chemical Co			

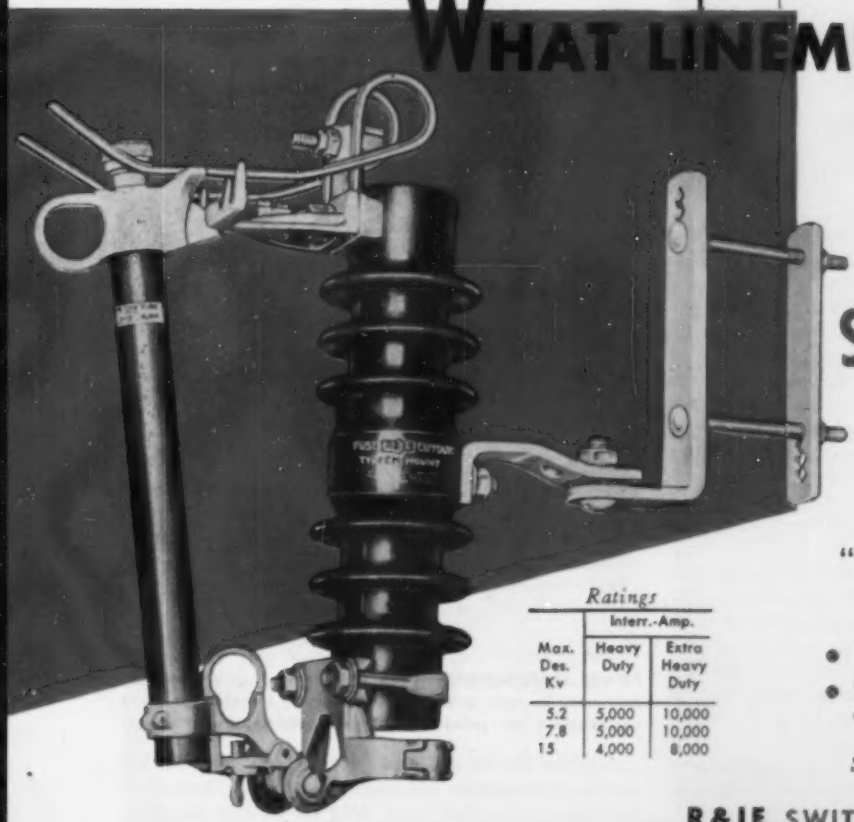
First in a series of four tables covering properties of typical plastics used primarily for electrical insulation. Part 1 of Table 1 was published in Electrical World, Oct. 17, 1955, page 160; ERS 11-20.

Other tables scheduled for forthcoming issues are: Molded Plastics with Fillers; ASTM-NEMA Grades of Laminated Thermosetting Sheets; and Laminated Sheet Insulation Not Covered by ASTM-NEMA Grade.



1. Easy to handle—light, compact, no sharp edges. Cartons well identified.
2. Factory assembled mounting bracket—to porcelain.
3. Single nut positioning—vertical, 20 degrees; and swivel.
4. Accessible eye-bolt terminals, accommodate copper or aluminum conductor.
5. Easily re-fused, even with gloves—standard or load break holders, heavy or extra heavy duty interchangeable.
6. Fuseholder easily handled with fuse hook. Will not miss upper contact when closed with fuse hook. Large opening or lifting eyes.
7. Light, compact, no sharp edges for quick handling.

WHAT LINEMEN LIKE *about the* R&IE Series "C" CUTOUT



Ratings

Max. Des. Kv	Interr.-Amp. Heavy Duty	Interr.-Amp. Extra Heavy Duty
5.2	5,000	10,000
7.8	5,000	10,000
15	4,000	8,000

"You Get More for Your Money"

- Higher interrupting capacities.
- Heavy duty service at normal duty cost.

Send for descriptive folder

R&IE SWITCHING EQUIPMENT
DIVISION OF I-T-E CIRCUIT BREAKER CO.
GREENSBURG, PA.

STRUCTURES—steel or aluminum • TESTING DEVICES • KIRK KEY INTERLOCK SYSTEMS • ISOLATED PHASE BUS STRUCTURES • INTERRUPTER SWITCHES

INDOOR BUS SUPPORTS and BUS FABRICATION • OUTDOOR BUS SUPPORTS and AIR SWITCHES • SUBSTATION

Pushing UG Conduit Saves on Single-Duct Runs

(*Continued from page* 84)

costing $300, is lowered into the short trench and used to push galvanized steel conduit through to the other hole.

Cost of installing a typical 73-ft section of 2-in. conduit with the pushing method is compared with that for an open-cut, concrete-encased, fiber-duct method in the accompanying table. This shows that pipe pusher provides a savings of $451.96 or $6.19 per ft in this case.

When pushing 4-in. conduit a longer time is required, but a large savings is also attained.

Limitations to using the pipe pusher exist in locations where:

1. Soil contains sufficient rock to veer the conduit from its intended course.
2. Obstructions such as foreign utilities are numerous.
3. Maintenance of conduit grade is critical.
4. The number of conduits in a run is sufficiently high to warrant excavating a trench.
5. The soil condition is excessively corrosive.

Life of galvanized steel conduit in underground service is a question that may be raised. The company installed an underground conduit 17 years ago, and it is still in good condition.

Costs for Pipe-Pusher and Open-cut Installations in One Case

Method	*Installed Cost*		
	Total $		*$/Ft*
Pipe Pusher			
38 crew manhours, truck and driver for 1 hour, labor insurance, and contractors expense and profit	109.86		
73 ft of 2-in. galvanized steel conduit	38.69		
		148.55	2.04
Open Cut			
Removing and replacing 434 sq ft of 5 in. concrete sidewalk (half on drybed, half on earth), and installing fiber conduit in concrete by contractor	591.01		
73 ft of 2-in. fiber conduit	9.50		
		600.51	8.23
Savings with pipe pusher		*451.96*	*6.19*

DISTRIBUTION—Operation

Split-Bank Design Provides 3-Phase Power Economically

CHARLES H. WYATT, Chief Distribution Engineer, Oklahoma Gas & Electric Co, Oklahoma City

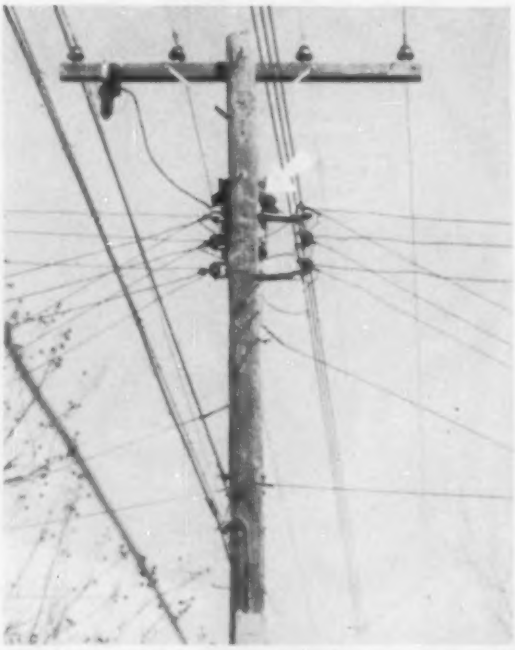
Economics, the importance of saving manpower, and the increasing requirements of service to small three-phase motors for air conditioners prompted the Oklahoma Gas & Electric Co to adopt the "split-bank" for three-phase service. In the split-bank, two transformers are installed on separate poles and connected in open-wye open-delta.

The practice of installing both transformers on the same pole almost always required replacement of the pole when the second transformer was installed, in order to provide adequate space for all facilities. Average cost of making these changes was $227, whereas installing a small transformer on an adjacent pole costs only $100, a savings of $127. Even on new construction the split-bank installation can be made at a saving of $38.

Calculations were made to determine voltage unbalance with the split-bank installation. They indicated that the unbalance with the split bank was no worse, and in many cases was less, than with both transformers on one pole.

The second transformer in a split-bank can be installed on any pole but is usually installed on the service pole of the three-phase customer. The secondaries of the second transformer are connected in open delta with the lighting secondaries. If the second transformer is installed on a pole other than the service pole of the three-phase customer, then the fourth secondary wire must be installed.

For satisfactory use of the split-bank design, the total steady-state voltage drop in the lighting secondaries and



POWER TRANSFORMER installed on separate pole from, but connected in open delta with, the lighting transformer saves replacement of poles to provide additional clearances

transformer should not exceed 6.6 v (120-v base) for the combined three-phase and single-phase loads. Three-phase requirements on other poles along the lighting secondary may be met by installing the power secondary conductor or by installing an additional transformer.

WHY....

"SPRING LOADED" FARGO HOT LINE CLAMPS are "STANDARD"

A heavy, vanadium steel spring compensates for conductor cold flow while under pressure and variables due to changing loads, fault currents and vibration.

"Vise Type" design with the two parts interlocking, increases the strength of the clamp (The clamp design follows the principle of the common bench vise).

Extra wide jaws increases conductor contact minimizing conductor cold flow by reducing the pressure per unit area. Larger heat radiating surfaces holds joint temperatures down. The wide jaws assure good electrical interconnection between strands because every strand of the rated conductors will be under at least one pressure zone.

Small conductors cannot be locked behind the jaws thereby eliminating the danger of a poor connection.

Completely enclosed greased threads are protected against weathering and may easily be loosened after long exposures.

Large "ears" or "lugs" assure a positive grip in all makes of hot sticks.

The thermal expansion of both jaws is equal as they are cast in "like" metals. In the aluminum or plated aluminum Fargo hot line clamps both jaws are aluminum and in the bronze clamp both jaws are bronze to assure uniform expansion when subjected to varying loads and temperatures.

Fargo hot line clamps are available in bronze, plated bronze, aluminum or plated aluminum to handle all combinations of conductors from 8 sol. to 397,500 ACSR plus rods.

The four sizes of the "AGE-Series" permit the most economical selection of clamps.

Ask your Line Material Field Engineer for complete details.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N.Y.

Distributed by

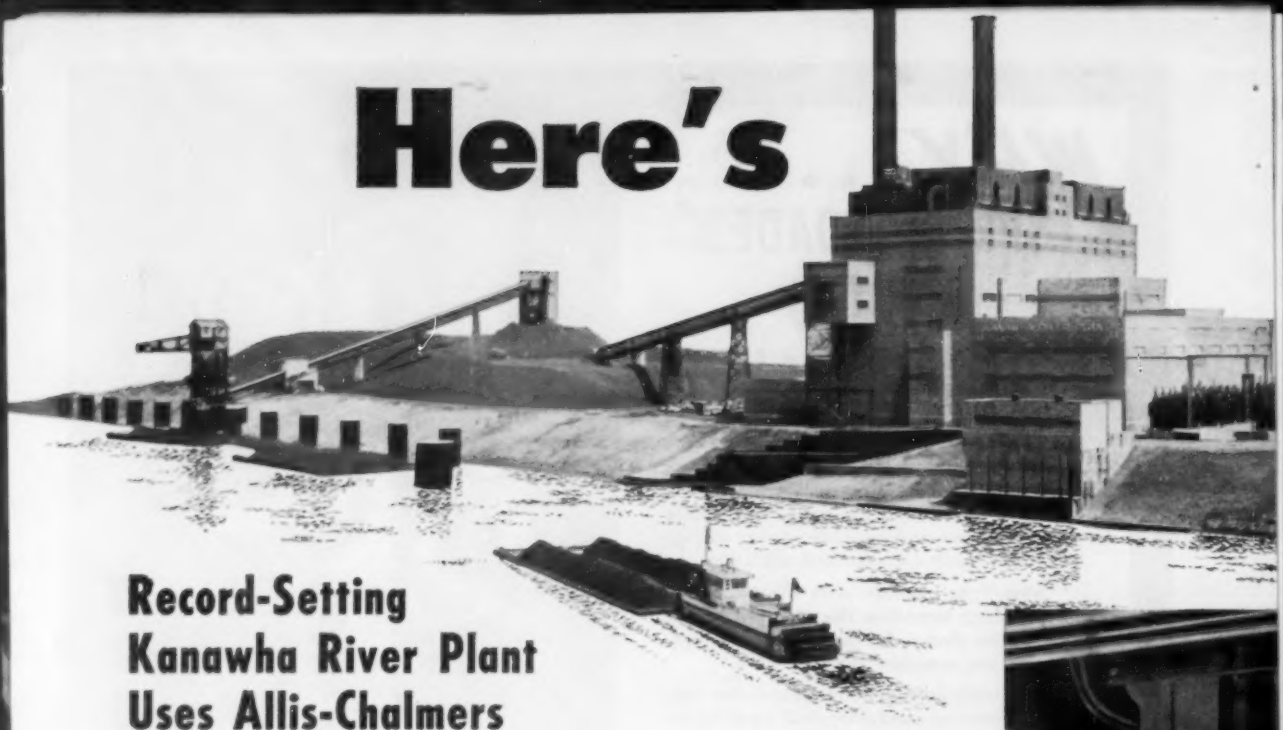
LINE MATERIAL COMPANY

(A McGraw Electric Company Division)

Milwaukee, Wisconsin

LM

Here's



Record-Setting Kanawha River Plant Uses Allis-Chalmers Condensers

'54 tops record-setting '53!

The 9170 Btu per kilowatthour annual heat rate at Kanawha River Plant was lowest in the nation in 1953 according to the Federal Power Commission. In 1954 the rate was even lower . . . 9133 Btu per kilowatthour, again lowest in the nation.

That means only 7/10 of a pound of coal is required to produce a kilowatthour of electric energy at this outstanding plant.

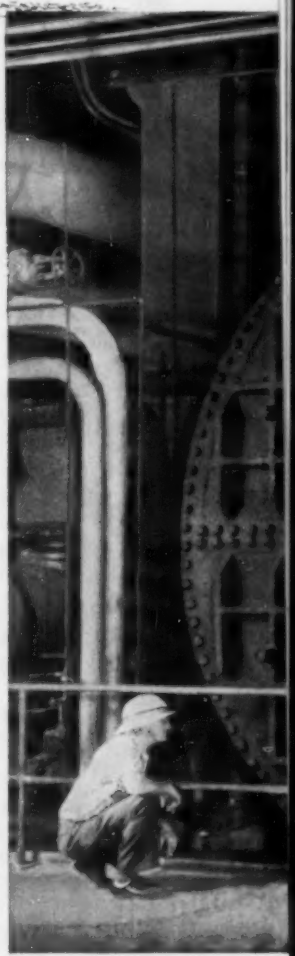
The Kanawha River Plant is owned by Appalachian Electric Power Company. It is one of 12 major power plants in the American Gas and Electric System.

Condensers are Multi-Steam Path Design

Two 90,000 square foot single-pass Allis-Chalmers condensers serve its 215,000-kw steam turbine generators.

These condensers are of multi-steam path design. This unique design makes all tubes completely effective by directing steam to even the remote sections of the condenser. The result is high vacuum, high condensate temperature and good deaeration . . . high operating efficiency.

For more information on how Allis-Chalmers multi-steam path design contributes to efficiency, contact your nearby A-C office or Allis-Chalmers, Milwaukee 1, Wisconsin. A-4772

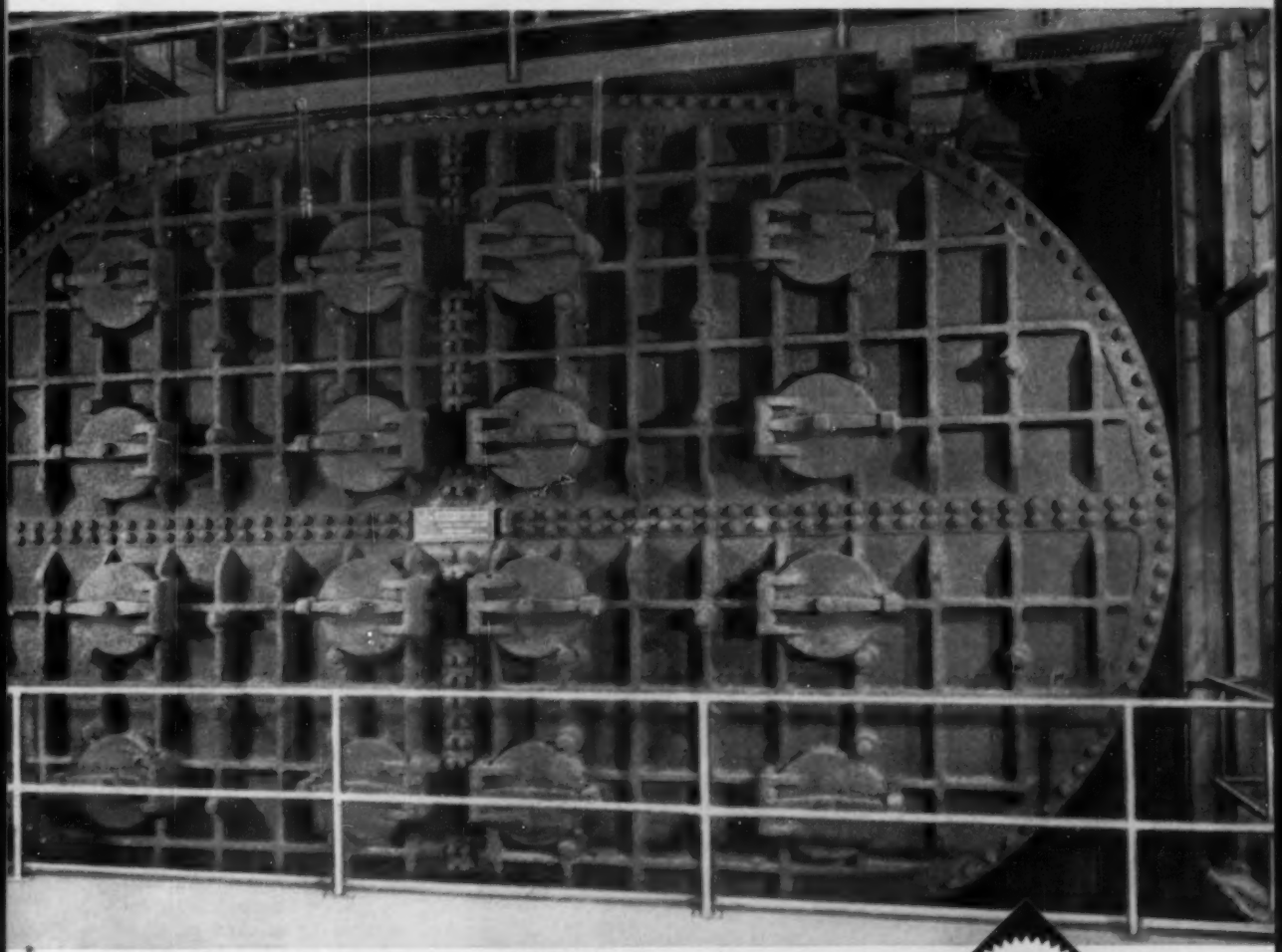


A Size and Type for Any Need

Round Oval Rectangular

ALLIS-

Condenser for Most Efficient Plant



This 90,000 square foot condenser serves 215,000-kw steam turbine generator.

CHALMERS

A-C ALLIS-CHALMERS

Strip Heaters Cut Condensation in Tank

KENNETH W. ANDERSON, Sales Dept, Pacific Power & Light Co, Sandpoint, Ida.

Strip heaters now hold a pole-treating solution at a constant temperature for the Schaefer-Hitchcock Co, Sandpoint, Idaho. The company found that moisture condensation is minimized when the temperature of the solution is kept at 200F. In addition, labor costs have been reduced because the solution can be brought up to operating temperature quickly.

The company applies the full-length, non-pressure, hot-and-cold process to Western Red Cedar poles in accordance with EEI specifications. Treating solution is petroleum with 5% pentachlorophenol. Steam is the primary source of heat in the process.

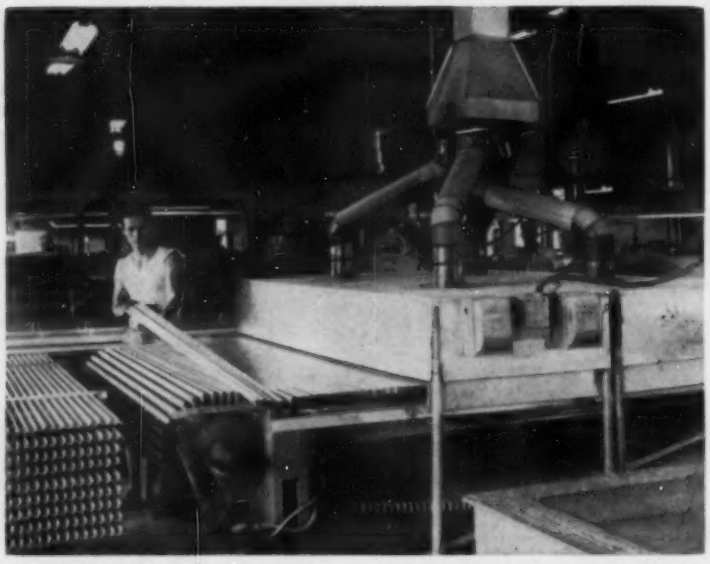
The treating solution is maintained at the 200F temperature in a 35,000-gal upright storage tank. To hold this temperature, 14 strip heaters, rated at 1.5 kw each, were clamped in pairs on studs around the lower third of the tank. An A-R type thermostat, situated at about the middle of the tank, controls the heaters through a 90-amp magnetic contactor. The tank is insulated with 3⅝-in. of loose vermiculite in an aluminum shell.

POLE-TREATING SOLUTION stored in a 35,000-gal upright tank (background), and kept at 200F by electric heaters, cuts condensation, labor and operating costs

Estimated monthly energy consumption is about 5,000 kwhr. Actual consumption depends upon the weather and the number of times the solution is used. Steam from the boiler formerly raised the temperature from ambient to 220F at the rate of 10 deg/hour/30,000 gal of solution. But the operating cost of this electric installation is considerably below that of the steam system.

This application was designed by the author. Consultants were L. J. Davis, president and general manager, and Roy Strain, chief engineer of Schaefer-Hitchcock Co.

Infrared Oven Speeds Output of Painted Aluminum Bars



ENAMEL IS DRIED on aluminum T-bars in 4 min. Bars may be handled right after emerging from 30-kw infrared oven. Monthly bar production is 250,000 lineal ft

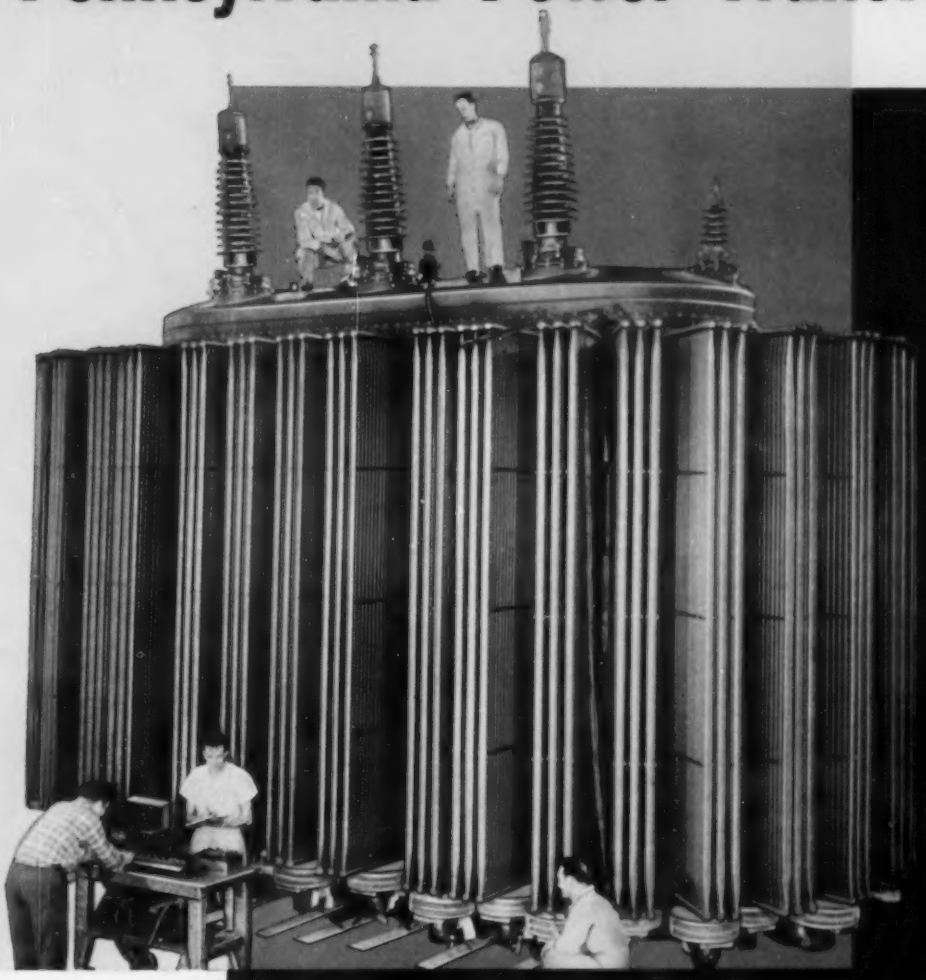
LOUIS E. ANDERSON, Industrial Heating Consultant, Department of Water & Power, Los Angeles, Calif.

An important tool in the production of aluminum T-bars for lightweight suspended ceilings is the 30-kw infrared oven used by Lok-Products Co, Los Angeles. The oven means greater comfort for the employees, and allows the handling of the T-bars right after they are baked. Heating time is reduced to a mere 4 min because only the paint and surface of the bars need be heated. Installed cost and required space of the infrared oven are less than those for a comparable gas unit.

To process about 250,000 lineal ft of bar each month, precut bars travel on rollers at 40 fpm into a sand-blasting machine, through paint rollers, then on to an oven conveyor. The 9 ft wide by 5½ ft long oven is lined with 24 pyrex tube heaters (with reflectors), each rated 1.25 kw.

(*More Industrials on page* 97)

68,000/90,666 Kva THREE PHASE
Pennsylvania Power Transformer



This main generating station transformer is one of four Pennsylvania power transformers located at the steam generating plant of a large Southern utility. Core form in design, this unit steps up the generated voltage of 13.2 Kv to the transmission voltage of 132 Kv. Self-cooled, the transformer carries a rating of 68,000 Kva. With fans in operation, the rating becomes 90,666 Kva. Men in photograph above are testing resistance of the transformer windings.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division

CANONSBURG, PENNSYLVANIA · *Greater Pittsburgh District*

SEE NEXT PAGE FOR INSIDE STORY

inside a

68,000/90,666 Kva THREE PHASE Pennsylvania Power Transformer

Top changers are mounted above core and coils where they are easily reached through large manholes in the tank cover.

Top leads are connected to straight line tap changers through heavy pressboard tubes.

Line ends of coils are heavily insulated to provide extra protection against surge voltage stresses.

Coils are precompressed with a force equal to the highest short circuit stress and built into transformer at the compressed dimension. This prevents mechanical distortion of the coils if short circuit stresses occur.

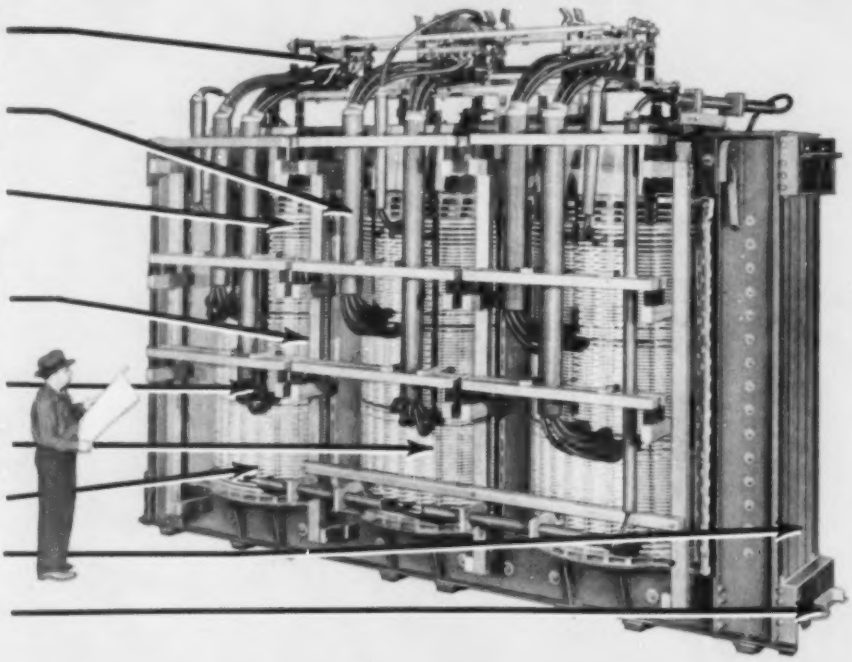
Two sets of taps per coil assure proper electrical and mechanical balance in the high voltage windings.

Continuous pancake windings in high voltage and low voltage coils.

Circular coils electrically balanced both radially and axially against short circuit stresses.

Five-legged core reduces height of transformer.

Guide plates fix the position of the core and coil assembly in the tank.



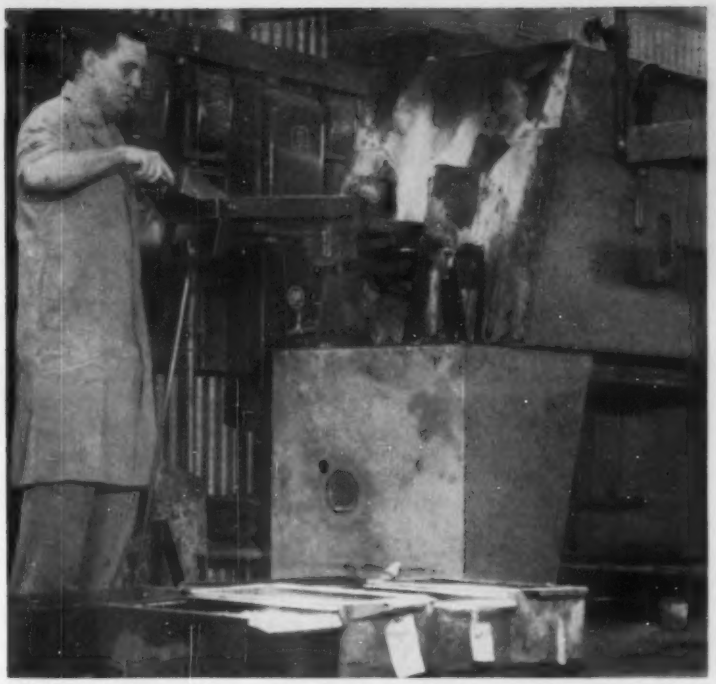
68,000/90,666 Kva, Three Phase, 55 C. Temperature Rise.
Self-cooled/forced-air-cooled.
High voltage: 132,000 Grd.Y/ 76,200 volts. Low voltage: 13,200 volts.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division

CANONSBURG, PENNSYLVANIA • *Greater Pittsburgh District*

For exterior view of this transformer see other side.



SHAKER FURNACE with controlled atmosphere receives small parts to begin austempering. Furnace has 45 kw of heaters

Electric Heat Austempers Metal Parts

LEWIS B. REED, Industrial Heating Consultant, Department of Water & Power, Los Angeles, Calif.

Electric heat allows fine control of the austempering process for hardening small, thin metal sections at McCulloch Motors, Los Angeles. About 95 kw of heat and some motor load are used in an operation that handles up to 20,000 pieces per hour of thin metal parts for chain saws. The longest piece is about 1½ in.

In ordinary heat treating, ferrous metal is "soaked" at 1,500F or higher and then quenched in water or oil at room temperature. The austenite is transformed into a crystalline structure called martensite. With austempering the metal is heated in the same manner, but it is quenched in molten salt at a constant temperature between 400 and 800F. The higher quench temperature transforms the austenite into a crystalline form, called bainite, which is equivalent to martensite but which is superior in ductility.

Austempering is particularly adaptable to very thin sections and small metal parts that will cool fast enough to prevent distortion or stress.

In the operation at McCulloch's, chain parts are first pre-cleaned in a detergent bath. They are put into a shaker hearth furnace equipped with automatic atmospheric control. The furnace has 45 kw of nichrome ceramic-coated elements that maintain a temperature of 1,550F. The parts drop from the hearth into the molten salt maintained at about 500F by 45 kw of hairpin heating units mounted on the sides of the tank. The furnace extends down into the bath to keep the parts from being exposed to air until removed from the salt.

Parts remain in the bath for 30 to 40 min. This timing is accomplished by the speed of a submerged screen conveyor which the parts fall upon. The quench is followed by a water wash at room temperature to remove salt, and an oil bath to remove rust. Transfers between baths are handled by submerged screen conveyors. Resulting hardness is Rockwell C 52.

Motor load includes 2 hp for salt bath mixers and 1 hp for conveyors. With one furnace in operation, this austempering process can handle chain link spacers, depth gages, and cutter teeth of either high carbon alloy steel or AISI steel at the rate of 20,000 parts an hr.

INDUSTRIAL BRIEFS

Molding nickel or bronze anodes used in the plating industry is done at Univertical Foundry & Machine Co plant, Detroit, with expendable shell molds used as liners for permanent metal molds. This prevents the hot anode metal from picking up iron from a permanent mold. It also obviates frequent replacement of the permanent molds. Anodes up to 100 in. can be obtained by joining the proper number of 10-in. sections of shell mold. The bronze or nickel is heated in one-ton indirect arc furnaces. Two furnaces for the nickel are of 600-kva each. Three furnaces for the copper are of 300 kva each. M. W. Heidman, Power Sales Engineer, The Detroit Edison Co, Detroit.

Drying box board coatings with infrared heat has enabled Paper Products Co, Inc, Cincinnati, Ohio, to make immediate corrections for weather changes and differences in box board coatings. As a by-product the company realizes a better product quality, obtained with simple controls. The box board is carried under fifteen 1,100-w infrared units on an 80-ft-conveyor. Each heating unit is wired into separately switched sections to yield flexibility. Six 250-w infrared lamps mounted at the end of the conveyor can be used as "emergency heat" when an unusual amount is required. Company officials selected radiant heat because of its simplicity, ease, of installation, cleaniness, and safety due to the lack of an open flame. Thomas V. Morrow, Power Engineer, Cincinnati Gas & Electric Co, Cincinnati, Ohio.

Improving quality of clay fed to a 75 hp pug mill at Mill Hall Clay Products Co, Williamsport, Pa., has increased over-all plant efficiency, decreased rejects from 20% to less than 2%, improved the quality of produced ceramic pipe and conduit, increased production, and increased profits. Until a 20 kw impactor was installed between the dry pan and pug mill so that all clay would be pounded to a uniform quality, the raw material varied from time to time and its quality depended upon the location in the quarry from which it was removed. K. H. Breon, Industrial Representative, Pennsylvania Power & Light Co, Williamsport, Pa.

Direct Lighting Calls Bring Direct Results

Can a utility sell lighting by personal visit to customer and make it pay? Kansas Gas & Electric Co is answering this question in a new test program

C. A. SPARK, Residential Consultant, Kansas Gas & Electric Co, Wichita, Kan.

Portable lamp and lighting fixture promotion is treated entirely different from appliance promotion in a current test program now being conducted by Kansas Gas and Electric Co. Last fall, this electric utility started a continuing program to test the effectiveness of direct home lighting promotion on a person-to-person basis.

Others Too Busy to Do Job

Mass promotion forms the backbone of the activity in arousing interest and developing prospects. But KG&E believes that the utility must assume the responsibility for personal customer contact to advise on specific application of lighting principles. Electrical contractors, fixture dealers and portable lamp salesmen are generally not qualified for the job of making light conditioning recommendations, or they are too busy in other fields of work to take the time for personal calls.

To bridge this gap between the arousing of interest and the ultimate application of lighting in the customer's home, our company employed four lighting advisers who are trained and equipped to make complete lighting recommendations. All have had thorough lighting training; two have graduated from a college course in interior decoration and the other two have had decorating experience.

Group presentations, club programs and "lighting parties" staged by one of the company's home economists, who is now specifically assigned to home lighting, generate prospects who want further information and help. These prospects, together with those drawn from TV, newspaper or radio promotion, are assigned to the advisers on a territory basis.

Each adviser is furnished with a specially-painted station wagon, selected as the most practical vehicle for the job. As the advisers carry considerable demonstration equipment and portable lamps, the station wagons allow adequate storage room and easy access, and they present a smart appearance when driven up to a customer's home.

Use the User

The advisers average about 125 calls per month, almost all of them follow-ups on prospects developed by mass promotion or in group demonstrations. Many customers refer the advisers to friends who have seen the remodeled lighting installations in their homes.

Fixtures and Lamps Both Sell

Direct results of the personal customer calls have been about equally divided between installation of permanent fixtures and purchases of portable lamps. Sales are channeled through cooperating dealers and suppliers. Approximately 125 ft of lighted valance, 125 permanently installed fixtures, 100 portable lamps are sold each month as a result of the direct sales effort plus about 50 lamps modernized with proper size bulbs, diffusing bowls, wide harps or new shades.

Stores' Sales Also Jump

Of more importance than the direct results achieved is the stimulation of lighting equipment sales through example and promotion. This has increased business appreciably for Wichita dealers. One large store reports its portable lamp business is 20% better than last year, although approximately the same number of new homes are being built in Wichita as during the previous year. Fixture suppliers report noticeable increases in fixtures sales, both as to quantity and quality.

Complete Report Soon

Although selling lighting by the direct personal method is not too common, Kansas G&E has been satisfied with the results of this promotion. True, lighting load is small as compared with that of many major appliances, but use factor is extremely high. Furthermore, most lighting load is off-peak.

A complete report on the first year of the continuing program, currently being conducted by Mississippi Power & Light Company in addition to Kansas Gas and Electric Company, will be released after Dec. 1. The plan was prepared and is being coordinated by Ebasco Services, Inc, for the Lamp Division of General Electric Co.

DRIVING SPECIAL KG&E STATION WAGONS, four lighting advisors average 125 home calls each month. They follow up advertising promotion, make direct sales

from Iowa-Illinois Gas and Electric

"Penta-treated poles are clean, easy to handle, last longer!"

Iowa-Illinois Gas and Electric Co. first used Penta-treated poles in 1941 and Penta-treated crossarms in 1944. Today, nearly 100% of the pine, fir and western red cedar poles installed by the company are Penta-treated. The company also uses Penta-treated wood for substation construction and platforms.

An Iowa-Illinois official reports: "Penta preserves poles much longer, keeps wood from rotting away and protects it from fungi in the air. The average life of an untreated pole is 15 to 20 years. The Penta treatment should extend that life to about 40 years or more." Veteran Iowa-Illinois lineman says: "Penta-treated poles are much cleaner to work with and we don't get the skin irritations we used to before we began using poles treated with Penta."

PENTA-TREATED WOOD IS CLEAN because Penta stays locked in wood cells, won't bleed or leach out, gives wood long-lasting protection against decay, and against termites and other wood-destroying insects as well. Clean, dry Penta-preserved wood won't "burn" hands or stain clothing, makes line installation and maintenance easier.

PENTA PROTECTS POLES, CROSSARMS, TRANSFORMER PLATFORMS, BRACES, CONTROL BOXES AND PLANKING. Mail coupon for list of 85 treating plants that will apply Penta for you . . . and for FREE Penta "Poles and Crossarms" booklet.

Where creative chemistry works wonders for you

Visit Monsanto's exhibit at Walt Disney's Disneyland Anaheim, California

MONSANTO CHEMICALS – PLASTICS

FREE BOOKLET

Organic Chemicals Division
MONSANTO CHEMICAL COMPANY
Box 478-N-8
St. Louis 1, Missouri

Please send me ☐ "Poles and Crossarms" booklet
☐ List of 85 Penta-treating plants

Name .....

Address .....

City ..... *State* .....

NEW EQUIPMENT

Hydraulic Digger

Main features claimed for the Model 4401-H hydraulic earth borer are: (1) smooth operation; (2) easy maintenance; (3) no damage due to stalling; and (4) reversible rotation (dirt can be "shimmied" off flighting).

A power take-off drives a gear-type pump which in turn powers a reversible gear-type hydraulic motor for rotation of the digger. Precise control is provided by a hollow-plunger valve located in the cab or at the rear of the truck.

The unit is supplied with augers for digging 8-ft holes. This can be deepened, if desired. Flighting in 3 to 5½-ft lengths is available for holes from 8 to 22 in. diam.

When joined with the Model 4700 power derrick, a double-sheave and double-winch arrangement enables the derrick to handle a pole and the digger at the same time.

J. H. Holan Corp, 4100 W. 150th St, Cleveland, Ohio.

Loadbreak Cutout

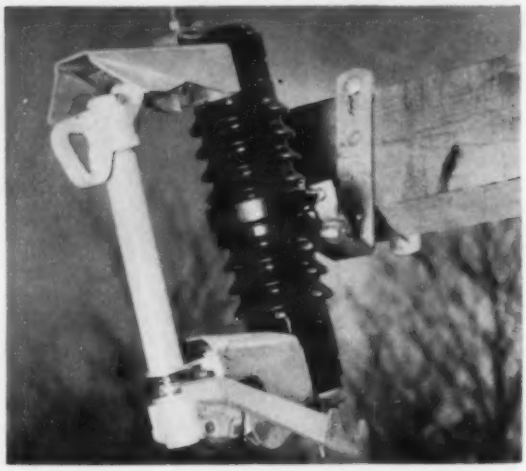
This loadbreak cutout (Type DX) for distribution circuits can interrupt load current as well as fault current.

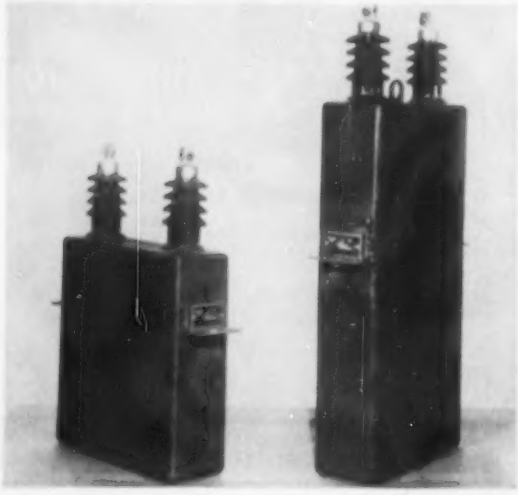
Under fault conditions, the fuse link blows and the fuse holder drops out to indicate its operation. To interrupt load current, the fuse link is broken mechanically by a lever-operated toggle mechanism located at the lower end of the fuse holder. A roller device coupled to the toggle linkage applies uniform tension to the lower end of the link, insuring link breakage at the fusible element inside the fuse tube. The toggle lever is hookstick operated.

The unit is offered in ratings from 5.2, 7.8 and 15 kv for load-break duty from 5 to 100 amp and for fault interruption up to 5,000 amp.

Loadbreak fuse holders are available for existing Type DX cutout installations.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.





Power Capacitors

A 50-kvar power capacitor (right) is being offered for voltages from 2.4 to 7.96 kv. These units will enable more capacity to be installed in locations where it has been needed but put off because of pole space limitations. They are also reported to provide lower installation costs per kvar.

Capacitors are impregnated with low-temperature Elemex suitable for operation from −40 to 46C. Steel tanks are corrosion protected by an aluminum metallizing process, a primer and an alkyd resin paint.

Length and width dimensions remain the same while the weight and height are about 50% greater than the 25 kvar units (left).

Line Material Co, Milwaukee 1, Wis.

(*More New Equipment on page* 102)

How **sure** are you

that you have good performing

grounds

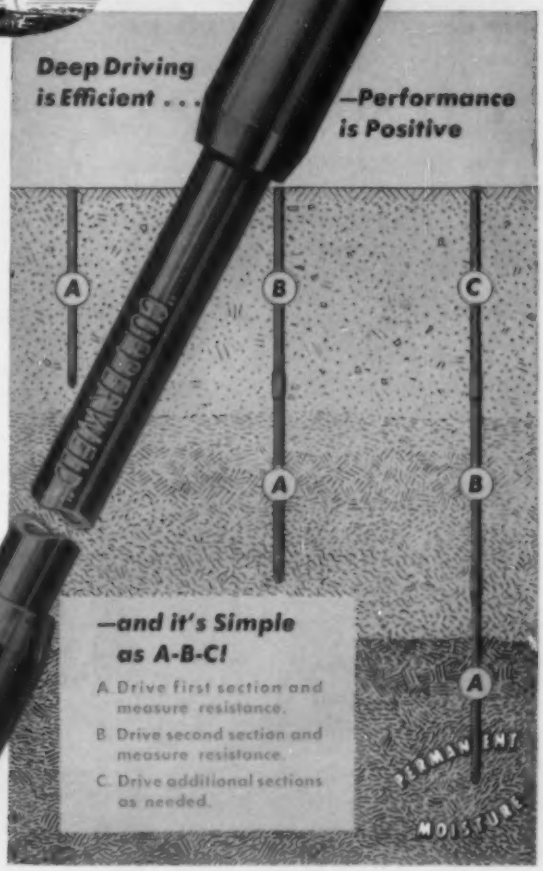
?

Driving a single ground rod into the soil doesn't necessarily mean that you have a good ground!

First, you must be sure that your connection has a low resistance to earth—the measure of electrical effectiveness. The safest way is to use a ground testing meter. If the resistance is high you need additional rods, spaced from the first, and connected in multiple—*or better yet*, use the new deep grounding method. Tremendous improvements in ground resistance have been obtained with Copperweld* Sectional Rods driven to depths of 20, 30, 40 feet or more. These rods penetrate low-resistance soils, where the moisture is permanent. Thus, you have a dependable ground the year 'round.

To be really sure, use Copperweld, for then you know that the ground rod will not have rusted out when you need it, and that you always have dependable copper-to-copper connections.

*Trade Mark



connect to

Copperweld TRADE MARK **sectional ground rods**

1955--our 40th year

COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION, Glassport, Pa.

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

—to be sure!

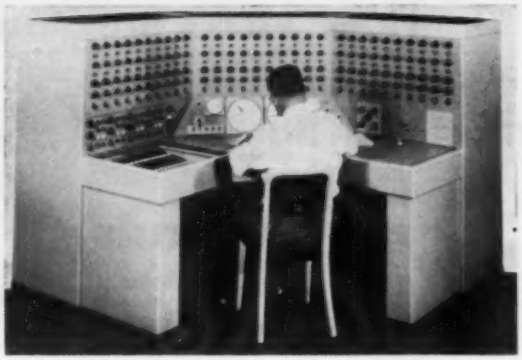
Network Computer

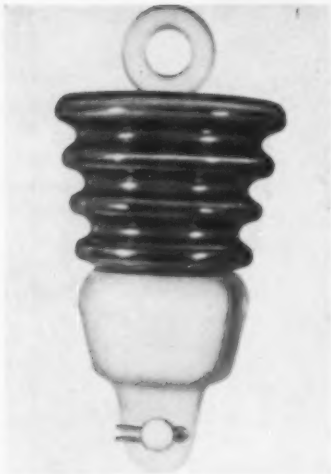
The Enns power network calculator is an analog computer which is said to solve complex power system problems quickly and economically.

It is reported that one man using this computer can solve ac load flow and voltage regulation problems, dc load flow problems, three phase faults, single and two-phase faults to ground, transformer tapping problems and other common power system computation.

Standard model has 75 circuits and a 50-amp bus.

Electronic Contractors, Inc, 2207 E. Burnside St, Portland 15, Or.





Strain Insulator

This grooved strain insulator is for dead-ending lines up to 12 kv. It is designed for use as a single unit and reportedly will do the work of two 6 in. or one 10 in. conventional disc-type unit.

There are no projections to receive the brunt of rough handling impact. The smooth even line formed by the outer edges of the corrugations and the side of the forged steel cap cause the unit to roll instead of tumble when dropped. Thus, mechanical impact is distributed over porcelain and cap, says the manufacturer.

R. Thomas & Sons Co, Lisbon, Ohio.

Insulating Tape

Bi-Seal self-bonding electrical tape is offered as primary insulation for permanent, water-tight sealing of conductor joints in cathodic protection cables. The tape (polyethylene based) is fungus-proof and withstands the attack of soil bacteria, says the manufacturer. A jacketing tape applied over the self-bonding tape provides added physical protection for the splice.

Tape properties are listed in the following table.

Dielectric Constant (ASTM D-150)	2.2×10^3 cps
Dielectric Strength (ASTM D-149)	1,000 vpm
Power Factor (ASTM D-150)	0.0006×10^3
Elongation, min. (ASTM-D-1,000)	350%
Volume Resistivity (ASTM-D-257), Ohm-cm	10^{13}
Operating Temperature	Maximum 80C, Minimum —40C
Color	Black
Resistance to acid, alkalies, vegetable oil, hydraulic fluid	Excellent
Corrosion (MIL-1-7798)	None

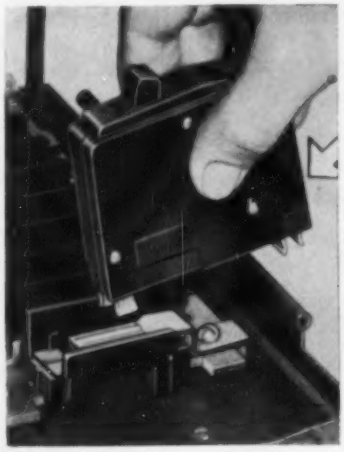
Bishop Mfg Corp, 6 Canfield Rd, Cedar Grove, N. J.

Chain Saw

The Model 5-20 chain saw delivers 5 hp and yet weighs only 20 lb. A high compression, short stroke engine cuts friction, increases engine life and reduces gas consumption, says the maker. An all-angle diaphragm carburetor permits cutting in any position —even upside down.

A brushcutter attachment converts the saw into a power scythe for cleaning out brambles, brush, undergrowth and small saplings. Straight blades are offered in sizes from 14 to 60 in. and plunge cut bow saw attachments in 14 and 18 in. sizes.

Homelite Corp, Riverdale Ave, Port Chester, N. Y.



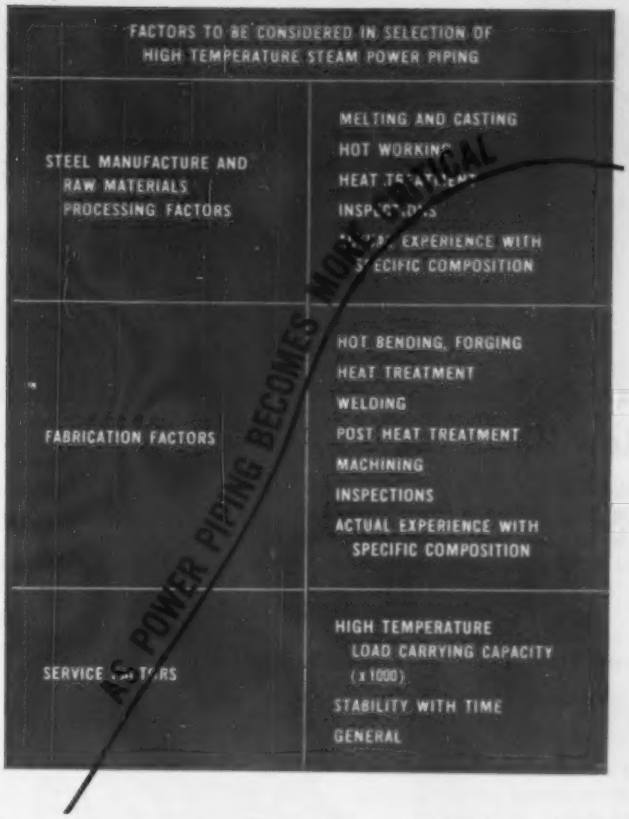
Plug-In Panelboard

Plug-in type panelboards (Type NQO) are reported to feature a right-angle "Swingrip" mounting arrangement that assures proper positioning of the breaker and a firm, positive connection. These panelboards with QO breakers can be used for both lighting and appliance circuit applications. They are available with main lugs only or main breaker in 14, 20, 30 or 42 circuit combinations.

Type QO breakers are quick-make, quick-break, ambient compensated and thermal-magnetic.

Square D Co, 6060 Rivard St, Detroit 11, Mich.

(*New Equipment cont'd on page* 104)



M. W. KELLOGG'S METALLURGICAL LABORATORY KEEPS PACE

As shown above, there are many factors—all increasingly important to steam-electric power plants—in selecting materials for tomorrow's main and reheat steam piping needs. Prepared by M. W. Kellogg's metallurgical laboratory, and reproduced here only in part, this chart indicates the extent to which Kellogg's metallurgical laboratory supports Kellogg's fabricating facilities in meeting the challenge of higher temperatures and pressures.

One recent Kellogg assignment, by a leading public utility, is the problem of selecting a super alloy for main steam piping to operate at 5500 psi and 1200 deg. F. A testimonial to the leadership and experience of the M. W. Kellogg metallurgical laboratory, this problem will include selection of special welding materials, welding techniques, and heat treating procedures.

Working closely with power companies at every stage of such problems is the prime function of Kellogg's metallurgical laboratory, and is carried through to periodic inspection of the piping in service. We welcome the opportunity to acquaint you with these facilities.

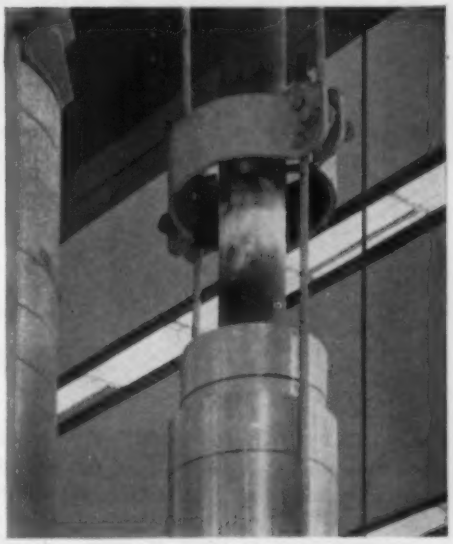
FABRICATED PRODUCTS DIVISION

THE M. W. KELLOGG COMPANY, 225 BROADWAY, NEW YORK 7, N. Y.

The Canadian Kellogg Company, Ltd., Toronto • Kellogg International Corporation, London

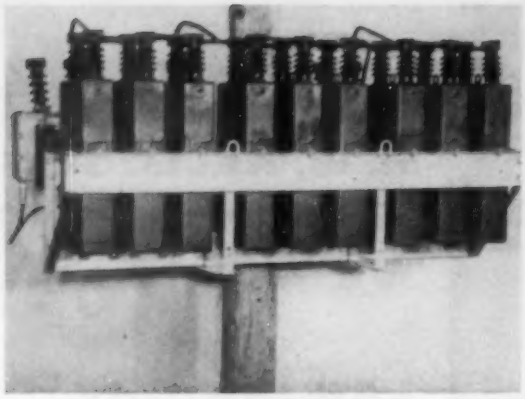
SUBSIDIARIES OF PULLMAN INCORPORATED

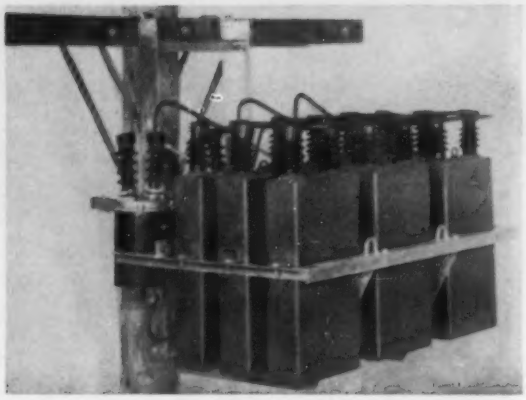
•Trademark of The M. W. Kellogg Company



The soundness of Kellogg's metallurgical studies prior to fabrication is evident from the condition of the welds on this stainless steel power piping when inspected recently. In service for 18 months at 2350 psi and 1100 deg. F., over 70 butt welds made with Kellogg's K-Weld* process were found to be in perfect condition. (*Photo at power station, Kearny, N. J., courtesy Public Service Electric & Gas Co.*)

POWER PIPING—THE VITAL LINK





Multiple and Single-Row Racks For 50-Kvar Capacitors

Racks are being offered for mounting the maker's new 50-kvar capacitor units (see p. 100) in single (left) or multiple rows (right). These racks are designed for direct pole mounting and will permit bank capacity to be doubled in the same pole space previously occupied by 25 kvar units.

Both racks are made of galvanized steel and are available complete with switch or fixed capacitor units. They are shipped ready for field installation on distribution systems rated 2.4 kv delta to 13.8 kv multi-grounded wye. Banks sizes may be 300, 450 or 600 kvar.

Mounting positions for NR switches vary to meet primary circuit configurations. A junction box is provided for control wiring. These units also feature a disconnect plug on NR switches and a lifting yoke.

Line Material Co, Milwaukee 1, Wis.

Current Transformers

Thermo-setting epoxy resin cast indoor-outdoor current transformers are designed for operation of meters and instruments in single or three-phase circuits up to 600 v.

Secondary terminations are on top of the transformer permitting the units to be mounted close together. These terminals also have a short-circuiting device which requires no tools to operate. Primary and secondary polarity markings are molded into the casing. Transformers can be mounted either vertically, horizontally or inverted by means of a steel base plate.

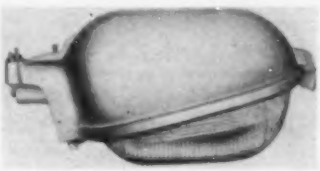
The units, designated Type BKM, are available in 1,200, 1,500, 2,000, 3,000 and 4,000-amp ratings. They all offer 0.3 accuracy by ASA standards with a burden of B–0.1, –0.2, –0.5 and B–1.

Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

Luminaires

No. 500 series street lighting luminaires are said to provide more uniform pavement brightness with less glare. They are offered with Alzak aluminum reflectors for types 2, 3 and 4 light distribution patterns.

Housing and refractor frames are made of cast aluminum alloy. The refractor is heavy, clear, pressed, prismatic crystal glass. An automatic latch and a molded rubber gasket provide protection against dust, weather and bugs. It is furnished for 1¼ or 2-in. slipfitter mounting.



NEPO Mfg Co, 6025 N. Keystone Ave, Chicago 30, Ill.

Service Protector

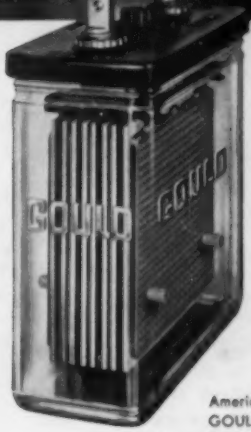
A protector for service entrance or feeder duty has an interrupting rating up to 200,000 amp. It is reported to be well suited for applications where high fault currents exist, such as on low voltage network systems in metropolitan areas.

The protector combines the interrupting ability of high-interrupting capacity CLF fuses with contacts similar to those used on air circuit breakers operated by a stored energy mechanism. Speed of opening and closing, therefore, is not dependent on speed of operation of the manual handle by the operator.

Units are available in 1,600, 2,300,

(*Continued on page* 106)

"You Get Extra Battery Performance –



America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

THANKS TO GOULD FIELD ENGINEERING SERVICE!"

It's a proven fact that regular, systematic battery care can add months, perhaps years, to the life of a battery! Gould's nation-wide Field Engineering Service enables *you* to get the benefit of this added service . . . and lower your over-all battery power costs.

Your Gould Field Engineer's one job is to see that you get maximum service from your batteries. He is factory-trained to instruct your own men as to correct maintenance routines and to help set up a simple record system for anticipating battery needs.

There's a Gould Field Engineer in your area. He's as near to you as your telephone. Call him. And when you see him, ask him for the new Gould Plus-Performance Plan material for your battery maintenance staff.

Always Use Gould-National Automobile and Truck Batteries

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GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

"BETTER BATTERIES THROUGH RESEARCH"

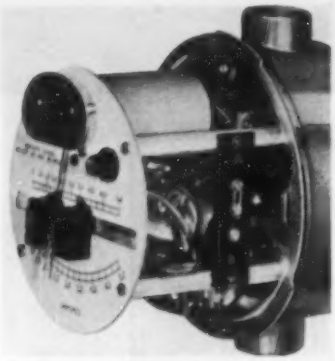
©1955 Gould-National Batteries, Inc.

New Equipment

(*Continued from page* 104)

3,000 and 3,500-amp ratings at 480 v, 60 cps, with Type CLF fuses. Provision is made for connection either to bus or cable.

General Electric Co, 1 River Rd, Schenectady 5, N. Y.



Current Controls

Socket-mounted current controls are designed to actuate oil switches for capacitor bank switching. They use a 120-v, 60-cps source for both control and load.

Off and on meter contacts with a minimum band width of ¼ amp are adjustable over a full scale of 5 amp. Time delay is provided by the thermal element. Load contacts are rated for a maximum load of 20 amp. A fuse is provided for the control circuit.

Components are mounted on a standard 6-prong meter base and protected by a glass cover. The unit may be mounted either indoors or outdoors.

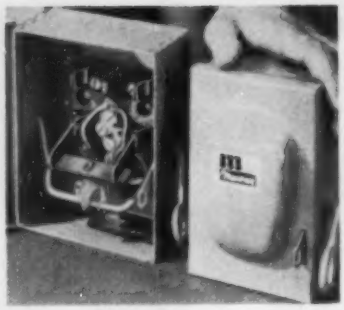
Line Material Co, Milwaukee 1, Wis.

Dual-Purpose Wire

"Densheath 900" can be used both as a building wire and a machine tool or appliance wire. It is rated at 600 v and consists of a bare copper conductor insulated with an oil and moisture resistant Densheath (polyvinyl chloride) 90C compound and a slipper compound overall to insure ease of pulling in conduits.

The wire is available in sizes from 14 AWG to 2000 Mcm when used as TW and in sizes from 14 to 4/0 when used as appliance wire.

Anaconda Wire & Cable Co, 25 Broadway, New York 4, N. Y.



Safety Switches

Two Type "G" safety switches are available—the "Small" switch measuring 5¼ x 2¾ x 6¾ in. and the "Pony" switch measuring 3⅞ x 2⅝ x 6¼ in. Both are fusible, single throw, side operated and have visible knife blade construction.

The "Small" switch (left) has a helper spring for simulated quick-break action and is offered with either plug or cartridge fuse, 2 or 3 wire. The "Poney" switch (right) is a 2-wire, single blade switch with plug fuse.

Murray Mfg Corp, 1250 Atlantic Ave, Brooklyn 16, N. Y.

Radiation Detector

The Servotherm infrared radiation pyrometer IR-1 measures temperature variations in locations where thermocouples, thermopiles and other devices are inadequate or inoperative. It is reported to be suitable for fine measurements in the nominal temperature range from ambient to 1000C. Response time is 25 milliseconds.

Output of the detector, which has its own meter, may be fed to a recorder for a continuous record.

Servo Corp of America, 20-20 Jericho Trnpk, New Hyde Park, Long Island, N. Y.

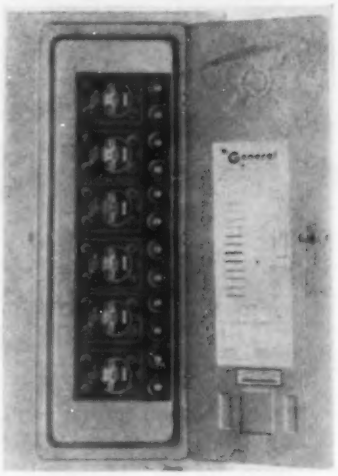
Synthetic Mica

Main advantage of a synthetic mica, now in commercial production, is that its properties can be controlled. This feature is expected to give the design engineer more leeway in the field of electrical insulation. The material, when combined with glass, is reported to result in a material with exceptional dimensional stability and precision, machinability, ability to retain tightly anchored metal inserts and offer outstanding dielectric insulating properties.

Dielectric properties of the synthetic mica and natural muscovite are compared in the table.

	Single Crystals	
	Synthetic Mica	Natural Muscovite
Dielectic Constant (1 Mc)	6.3	5.4
Power Factor (1 Mc)	0.0002	0.0003
Loss Factor (1 Mc)	0.0013	0.0016
Dielectric Strength, vpm	2200	2800

Synthetic Mica Corp, Caldwell, N. J.



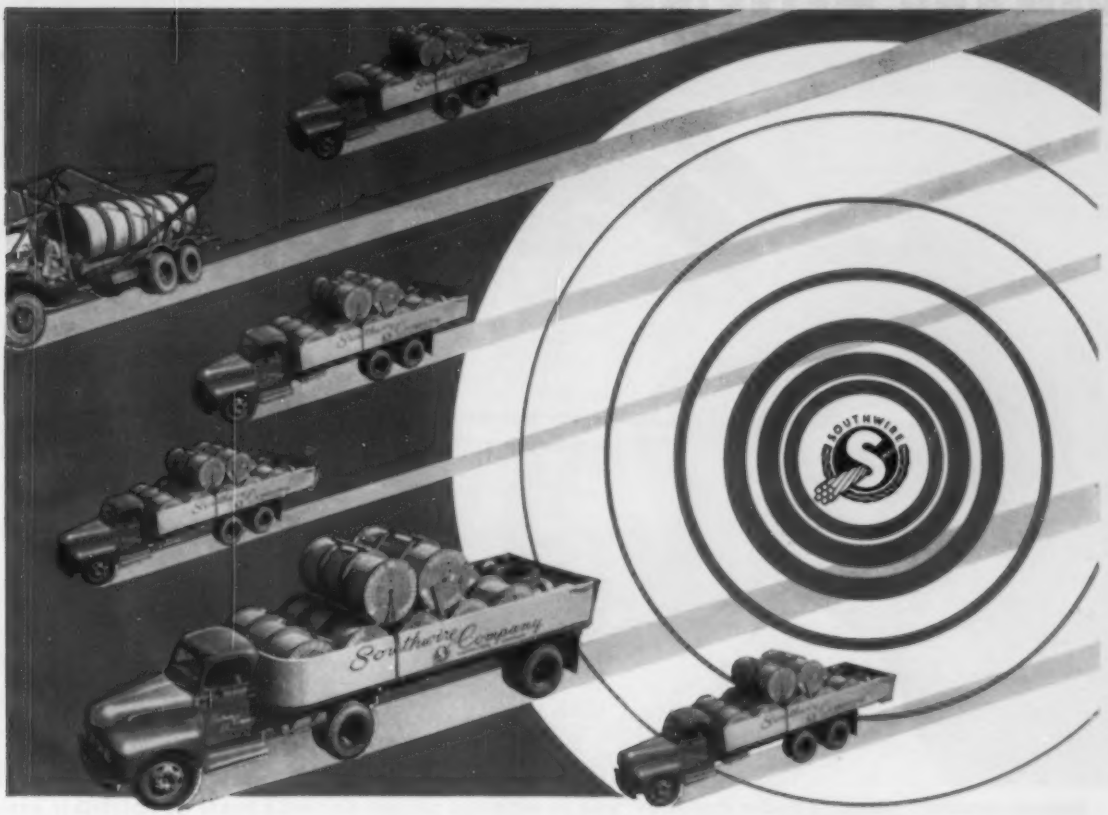
Service Entrance Unit

This service entrance enclosure, called Control-All, Jr, provides six independent, two-fuse pullout switches and twelve plug fuse branch circuits. It is rated for 125 amp.

The six pullout switches act as individual "disconnects" for heavy loads or as a "lighting main" for twelve 30-amp plug fuse branch circuits. The device provides two 60 amp and four 30 amp pullout switches. Line lugs take wire from No. 8 to No. 1/0 AWG.

General Switch Corp, 45 Roebling St, Brooklyn 11, N. Y.

(*More New Products on page* 110)



Southwire Trucks Make 1089 Trips and Cover 2 Million Miles a Year

To provide service on a par with Southwire quality

We learned a long time ago that, in this business, to win customers and keep them, service must be on a par with the quality of products. That's why Southwire operates its own fleet of modern trucks over a vast network—from Minnesota to Florida, from Pennsylvania to Texas. It is your positive assurance of dependable deliveries—direct to your warehouse or job site.

Southwire products are produced in our own modern plant to meet the most exacting requirements and specifications. Their quality is controlled from start to finish, checked and re-checked every step of the way, to give you the best.

Next time order Southwire products and get Southwire service automatically.

SOUTHWIRE PRODUCTS

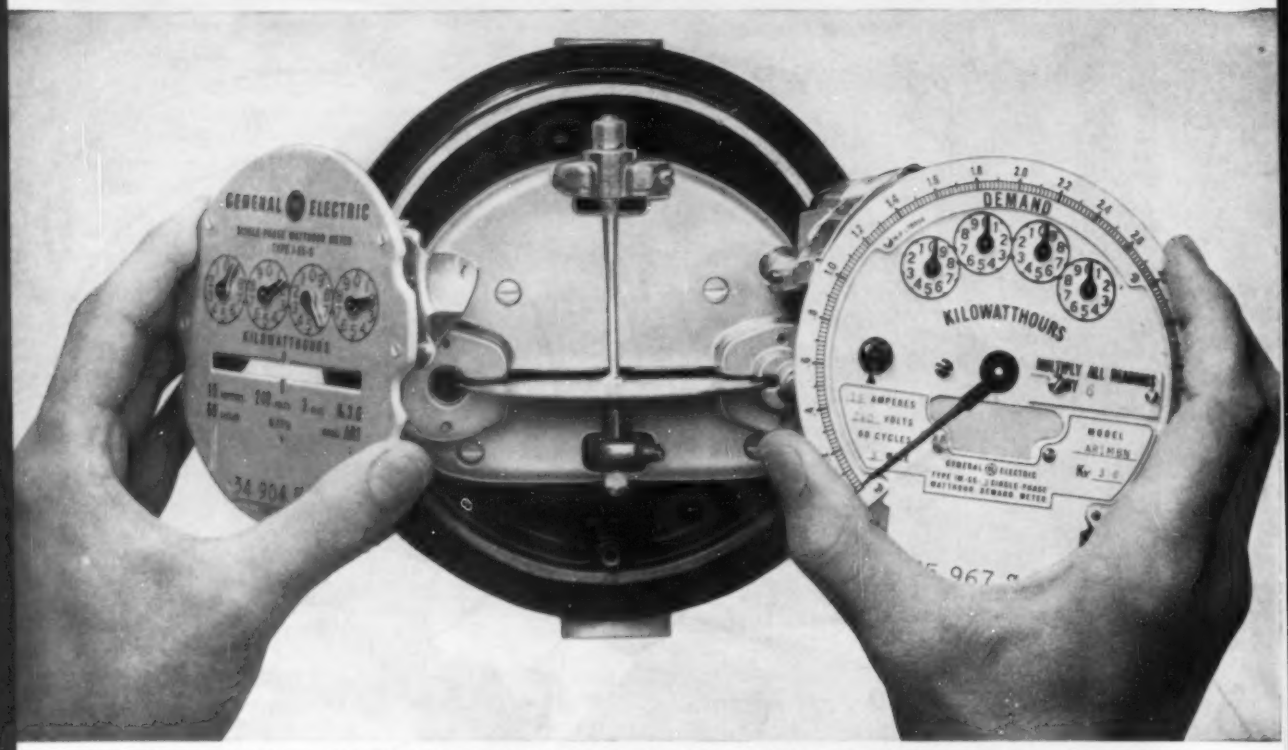
- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene Copper, Aluminum and Triplex
- Polyethylene Copper, Aluminum and Triplex
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories

Southwire Company

Carrollton, Georgia • Terrace 2-6311

ADVERTISEMENT

DEMAND METERING



DEMAND REGISTERS OFFER MAXIMUM FLEXIBILITY, MAY BE INSTALLED ON ANY G-E SINGLE-PHASE OR POLYPHASE METER

Demand Registers: The Most Reliable Means to Low Cost Demand Metering

- Increasing number of utilities are taking advantage of the benefits offered by demand registers
- Flexibility of register assures reduced inventory and operating costs
- Greatly reduced testing and maintenance expenses have resulted from improved designs

The dependable low-cost operation of mechanical demand registers has led to their increasing acceptance by the utility industry.

General Electric engineers have released test results which give assurance of increased reliability of demand registers. These tests show that the life of the register rotor has been extended up to 10 years. This fact means that the register will need testing and maintenance only during periodic meter tests. This assurance of dependable performance offers the utilities unlimited savings in their demand metering operation.

DIRECT GEAR DRIVE . . . Not only is the register on the same testing basis as the meter but also the demand register possesses the same stability of calibration as the watt-hour meter. This high degree of accuracy remains unchanged during life, and thus assures reliable operation for years. In comparison with other types of demand metering devices, the register is relatively unaffected by such variables as friction and climate.

REGISTER FLEXIBILITY . . . The versatility of design of General Electric's demand register offers the opportunity of converting the register to different scale classes, different electrical ratings, or any

available time interval. Standardization on one register ratio with a change in only the multiplier is but one of the many cost-saving methods which is available with only a demand register.

REDUCED INVENTORY . . . The opportunities for reduced inventory are unlimited with the use of demand registers. Any stock single-phase or polyphase watthour meter can be converted to a demand meter merely by substituting a demand register. This adaptability which results in reduced inventory and operating costs is unique only with demand registers.

IN SERVICE . . . A watthour meter can be readily converted to a demand meter simply by the interchanging of registers. Also, quick, easy, accurate and low-cost field testing can be realized with demand registers. With the use of a G-E self-checking adapter, the need for elaborate testing equipment and costly hours of labor is eliminated.

These facts offer you the greatest possible assurance that General Electric's demand registers are your most reliable means to low-cost demand metering.

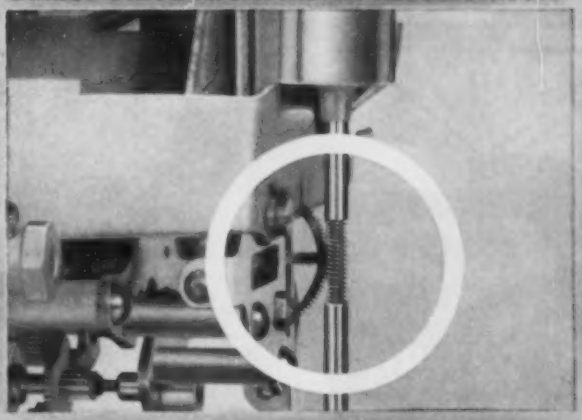
MANY UTILITIES . . . Increasing numbers of utilities are taking advantage of the benefits offered by demand registers. Here are but a few: Commonwealth Edison Company, Wisconsin Electric Power Company, Kansas Power and Light Company, Duke Power Company, Pacific Gas and Electric Company, Southern California Edison Company, Public Service Company of Oklahoma, and New Orleans Public Service Inc.

FOR MORE INFORMATION . . . If you would like more information on General Electric's mechanical demand registers, write to Section 621-12, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

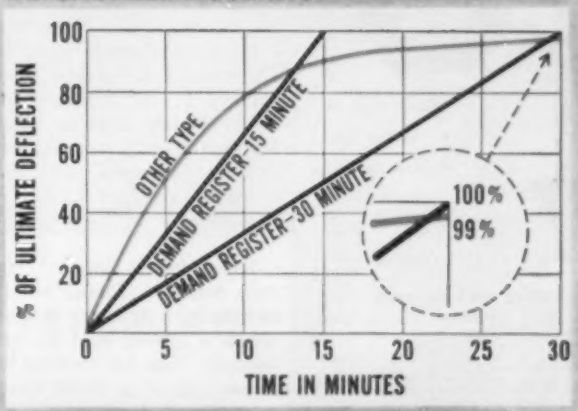
GENERAL ELECTRIC

DIRECT DRIVE FROM METER RESULTS IN . . .



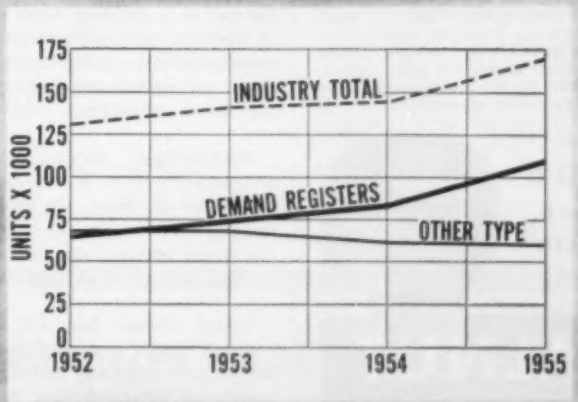
DIRECT GEAR DRIVE from the motor assures sustained accuracy for years.

DEPENDABLE ACCURACY



ONLY REGISTERS reach 100% of average demand after rated time interval.

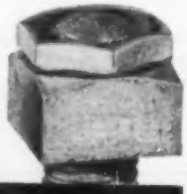
INCREASING UTILITY USE



INCREASING USE of demand register results from dependable operation.

• Eliminate checking and re-tightening
• Eliminate radio interference due to loose hardware

Every bolt-and-nut assembly locked with PALNUT Lock Nuts stays tight, despite weather, wind, stress and vibration. PALNUTS, tightened on top of the regular nuts, prevent loosening and falling off. Very low in cost — easily, speedily applied — require little space — may be used on new or existing assemblies. Hot dip galvanized, silicon bronze and other materials and finishes. Stocked by all leading pole line hardware manufacturers.



The PALNUT Co.
51 Cordier St.
Irvington 11,
N. J.

PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost

MORE NEW PRODUCTS

Hypro Engineering, Inc, 700 39th Ave, N.E., Minneapolis 21, Minn., has a lightweight **portable pump** with a vacuum switch that permits unattended operation. It has a capacity of up to 5 gpm with pressures up to 30 lb.

Crane Co, 836 S. Michigan Ave, Chicago 5, Ill., has a **globe valve** especially designed for use on liquid-immersed transformers. It comes in ¾, 1-½ and 2-in. sizes and is rated for 150-lb maximum pressure at 200F maximum temperature.

Hickok Electrical Instrument Co, 10572 Dupont Ave, Cleveland 8, Ohio, offers a **portable multimeter** that is protected against accidental burnouts. Industrial Model 455 has a sensitivity of 20,000 ohm per volt, ac or dc.

Metals & Controls Corp, Spencer Thermostat Div, Attleboro, Mass., announces a small tubular-shaped inherent **overheat protector** that can be mounted directly in motor windings or small transformer enclosures. It is sealed to withstand varnish dipping and baking.

Jones Motrola Corp, 432 Fairfield Ave, Stamford, Conn., has a hand **tachometer** with a stop button which retains a reading until the button is released. They are available in seven ranges from 50 to 10,000 rpm.

Minnesota Mining & Mfg Co, Dept. E5-252, St. Paul, Minn., offers a pressure-sensitive, **aluminum foil tape** for use as a moisture vapor barrier in communication cable splices. It is recommended for use in taping operations on plastic-insulated, plastic-sheathed cable splices.

Harnischfeger Corp, Electrical Products Div, 4628 W. National Ave, Milwaukee 46, Wisc., has available a five-step **push-button** for control of electrically operated machines. It can be used with either ac or dc circuits.

Killark Electric Mfg Co, Vandeventer & Easton Aves, St. Louis, Mo., has designed a two-way cast aluminum **vaporproof lighting fixture.** It can be used as an indicator light, a safety light or a blinker. It takes up to a 150-w lamp on each side.

Coast Pro-Seal & Mfg Co, 2235 Beverly Blvd, Los Angeles 57, Calif., is producing an electrical **potting compound** that withstands temperatures from below −60 to +180F.

Arrow-Hart & Hegeman Electric Co, Hartford, Conn., will supply "Quiette" **light switches** with a radioactive luminous button in the tip of the operating lever, if requested.

Thayer Industrial Products Co, North Caldwell, N. J., is producing **distribution blocks** designed to simplify wiring of panelboards and switchgear. They are rated at 600 v for either 70, 125 or 225 amp service with either 2, 4, 6, 8 or 10 taps.

General Electric Co, Nela Park, Cleveland 12, Ohio, has developed a 300-w standard voltage PAR-56 **flood lamp** which produces a controlled beam rectangular pattern. Rated life is 2,000 hr.

Porter-Cable Machine Co, 56 Exchange St, Syracuse, N. Y., has a portable **electric tool** that combines the functions of a jig-saw, router, jointer and shaper table.

Mathias L. Klein & Sons, 7200 McCormick Rd, Chicago 45, Ill., has a new skinning **knife** (Catalog No. 1550-5) for cable splicing, and needle nose pliers with **cutters.**

Permacel Tape Corp, New Brunswick, N. J., offers 2 mil polyester Mylar film, electrical heat curing **tapes** (No's 254 and 255). No. 254 is yellow colored and 255 is clear.

Minnesota Mining & Mfg Co, 900 Fauquier Ave, St. Paul 9, Minn., has an improved version of its "Scotchcast" **insulating resin** for making field splices in power and communication cables. Improvements are reported in durability, heat resistance, aging and "mixability."

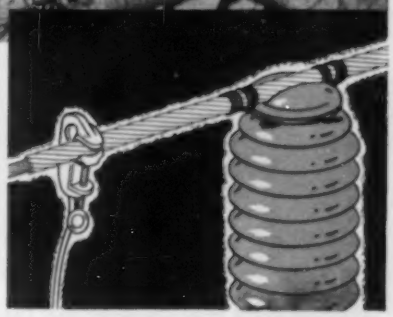
Servo-Tek Products Co, Inc, 1086 Goffle Rd, Hawthorne, N. J., is producing the "100" series of **adjustable speed drives** that permit a precise adjustment of speed over a range of 100:1. Models are available in ratings of ½ and ¼ hp for speeds between 36 and 3600 rpm.

Reduce TREE TRIMMING

Reduce maintenance expense . . . improve customer good-will by protecting your conductor with Preformed Line Guards. Metal or plastic guards available . . . all are accurately formed to fit snugly without loosening—ever. Easy to install—no tools needed.

These exclusive guards assure positive protection against the abrasive rubbing of tree limbs, corners of buildings, poles and other damaging objects. Dangers of grounding are eliminated . . . insulation life prolonged indefinitely. Conductor maintenance is nil.

For longer care-free service—a greater safety factor, specify Preformed Line Guards.



LINE GUARDS or ARMOR RODS

Line guards, a development from ARMOR Rods are used, like ARMOR Rods, to protect against arcover, chafing and mechanical wear due to concentrated stresses.

● *Made in accordance with or for use under one or more of the following U. S. Patents: 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.*

PREFORMED LINE PRODUCTS COMPANY

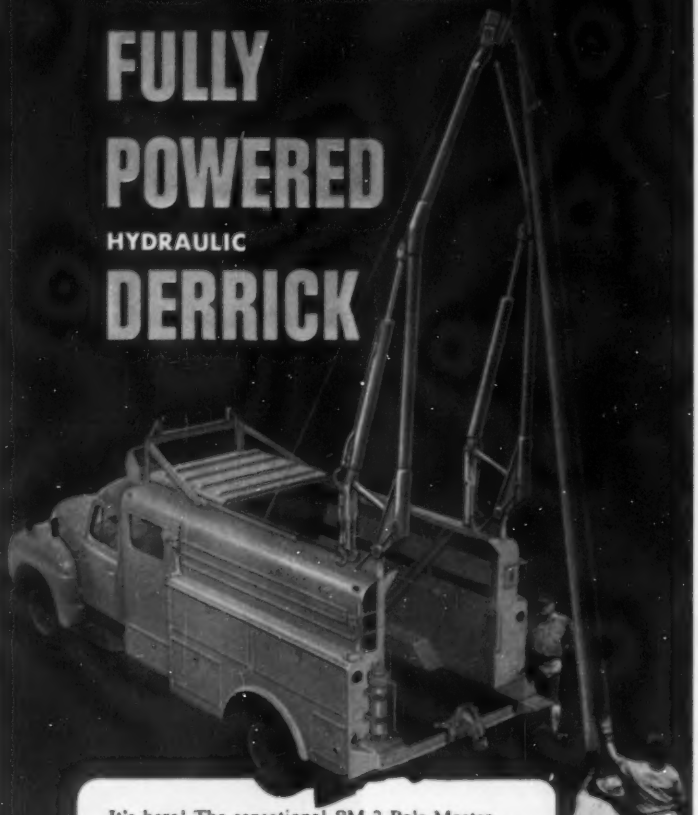
5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

POWERS American

PRESENTS THE PM-2

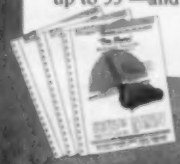
Pole-Master®

FULLY POWERED HYDRAULIC DERRICK



It's here! The sensational PM-2 Pole-Master . . . with an operating arc *well in excess* of 180 degrees. "Live boom"—actuated by twin hydraulic cylinders—can be moved under load. Head sheave can be threaded from ground. Stows *completely* out of the way . . . without obstructing body load area or roof. Always ready for use *instantly*, at the flick of a single-lever control.

In three sizes . . . for poles up to 40′—for poles up to 55′—and for poles up to 70′—installed on a Powers-American Line Body that's right for *your* job.



Bulletins describing Pole-Master Booms—Series PM-2, Series MD-2, and Series MD-4—will be sent, with price information, upon request. No obligation, of course!

McCABE-POWERS AUTO BODY COMPANY

3003 NORTH BROADWAY • ST. LOUIS 19, MO. 625 CEDAR ST. • BERKELEY 10, CALIF.

CATALOGS–BULLETINS

• **LIFTING MAGNETS:** Selection information, size and operating data, specifications, and dimensions on a line of lifting magnets are given in Bulletin No. 35-C. Stearns Magnetic Inc, Milwaukee 46, Wisc.

• **JUNCTION BOXES:** Catalog Section G-6-55, 4 pages, gives descriptions and sizes of hinged-cover type cast-aluminum-alloy weather-proof enclosures and boxes. Adalet Mfg Co, 14300 Lorain Ave, Cleveland 11, Ohio.

• **METALS & ALLOYS:** The effects of vacuum melting on properties of various metallic materials, and fabricating and machining of such metals, are discussed in Technical Bulletin VM-101. Included is detailed engineering data on two new vacuum melted high temperature alloys M-252 and J-1570. Carboloy Dept, General Electric Co, Detroit 32, Mich.

• **SILICONES:** A 4-page catalog lists various silicones in liquid and solid forms in catagories such as electrical insulating resins, oils and oil emulsions, water repellents, and silicone rubber gum stock and compounds. Linde Air Products Co, 30 E. 42nd St, New York 17k, N. Y.

• **VARIABLE SPEED TRANSMISSIONS:** Information on factors in drive selection and descriptions of types of automatic and remote control accessories for variable speed motor transmissions are given in a 7-page bulletin. Sterling Electric Motors, Inc, 5401 Telegraph Rd, Los Angeles 22, Calif.

• **MAGNETIC PULLEYS:** Bulletin No. 303-C covers electro-magnetic pulleys and pulley separators. It includes a simplified method for selecting the right pulley for various applications. Stearns Magnetic, Inc, Milwaukee 46, Wisc.

• **WIRING DEVICES:** A 68-page catalog contains descriptions and illustrations of electrical wiring devices, extension and cord sets, fuses, lamps, wall plates, push buttons and flashing devices. Eagle Electric Mfg. Co, 23-10 Bridge Plaza South, Long Island City 1, N. Y.

• **METAL TAGS:** A 26-page catalog illustrates a complete line of metal checks, tags and plates for numbering and marking all types of equipment. Dickey-Grabler Co, 10302 Madison Ave, Cleveland 2, Ohio.

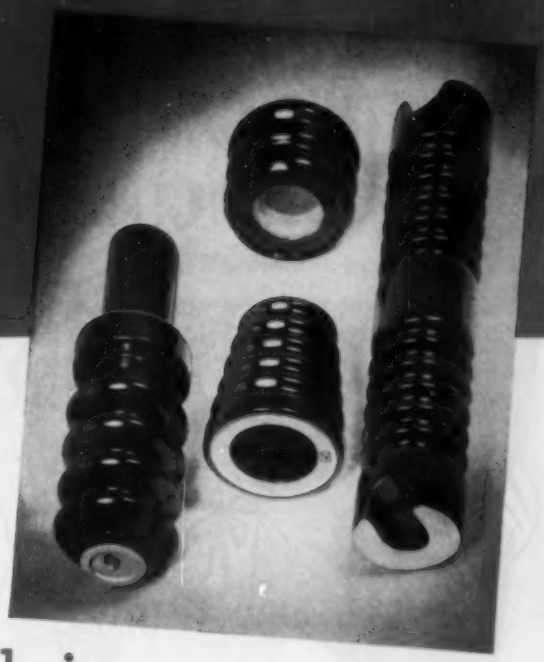
• **EXHAUST FANS:** Bulletin No. 6514, 4 pages, covers fans for heavy-duty exhaust applications. Construction features are described along with performance data such as fan speed, horsepower, and maximum net weight. Installation photos and dimensions are included. American Blower Corp, Detroit 32, Mich.

• **STEEL SIDING:** Stainless steel siding for single sheet and sandwich wall building construction is described in Bulletin 70-S. Joseph T. Ryerson & Son, Inc, Box 8000-A, Chicago 80, Ill.

• **POTENTIOMETER:** The Type K-2 potentiometer for potential difference measurements, for instrument checking and for precise temperature measurements is discussed in Data Sheet E-51(3), 4 pages. Accessories for typical measurements are also listed. Leeds & Northrup, 4934 Stenton Ave, Philadelphia 44, Pa.

(*More Catalogs on page* 114)

America's Finest Porcelain..



for Special Applications...

VICTOR

Purified Porcelain

Victor "know-how" has made many contributions to insulator progress. None is as important as *Purified* Porcelain. By instituting demineralization of water, modern microscreening, infrared drying, black light inspection, continuous electrical testing and many other advances, VICTOR gives you the finest insulator porcelain ever made!

VICTOR *Purified* Porcelain is ideal for special applications such as molded, extruded, and turned shapes. It has vastly greater uniformity in mechanical and electrical strength values, higher puncture voltage values, greater density, hardness and durability.

Our engineering, design and manufacturing facilities are ready to help you with specialized insulator problems. Write us.

FEATURES OF PURIFIED PORCELAIN

- Greater hardness and density
- Greater resistance to impact
- Greater thermal resistance
- Higher average puncture values
- Higher mechanical strength
- Takes a smoother, harder glaze
- Uniformity of quality available in no other porcelain

For the full facts on VICTOR "know-how," write for "The Story of Victor and Purified Porcelain." For engineering data on Victor's complete line of standard transmission and distribution insulators, write for Bulletin No. 4.

NEWS FROM VICTOR

With the completion of a brand new addition to its plant last year, Victor has almost doubled the area devoted to bushing and special porcelain manufacture. The new building was made necessary by increasing demands for special porcelain shapes made of Purified Porcelain.

SPECIFY VICTOR

Purified Porcelain Special Insulators

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware

THIS CABLE'S A SOLID CITIZEN
MAYOR
Collyer
COLLYER
INSULATED WIRE CO.
245 ROOSEVELT AVE.
PAWTUCKET, R. I.
Town or country, you won't find better cable for power distribution than Collyer Suprene Type RR Neoprene Jacketed Cable. Available for voltages from 0 to 8000, in shielded or unshielded construction, standard or special specifications. Write today for samples, recommendations, and prices.

● **GE BULLETINS:** The following are available from General Electric Co, Schenectady 5, N. Y.:

Saturable reactors for control of individual power loads are covered in Bulletin GEA-6351, 8 pages. It describes theory and application of saturable reactors. Included are wiring diagrams, ratings, model numbers, dimensions and list prices.

Magnetic starters for air conditioning and refrigeration equipment are described in GEA-6301. Features, ratings dimensions, wiring diagrams, catalog numbers and installation requirements are given.

Jet-pump motor features are outlined in Bulletin GEA-5902B. The bulletin also lists dimensions ratings and specifications according to NEMA frame sizes.

Limit switches are the subject of Bulletin GEA-6k31A. Switches covered include lever-operated snap action, small oil-tight snap action, lever type-double circuit, rotating cam, and lever operated-slow make and break switches. Ratings and dimensions of each type are given.

● **INDUCTION HEATER:** A 30-kw induction heater for the metal-working industry is described and illustrated in Bulletin 85-875. Bulletin covers complete control and output facilities, and the work station housing for all components. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

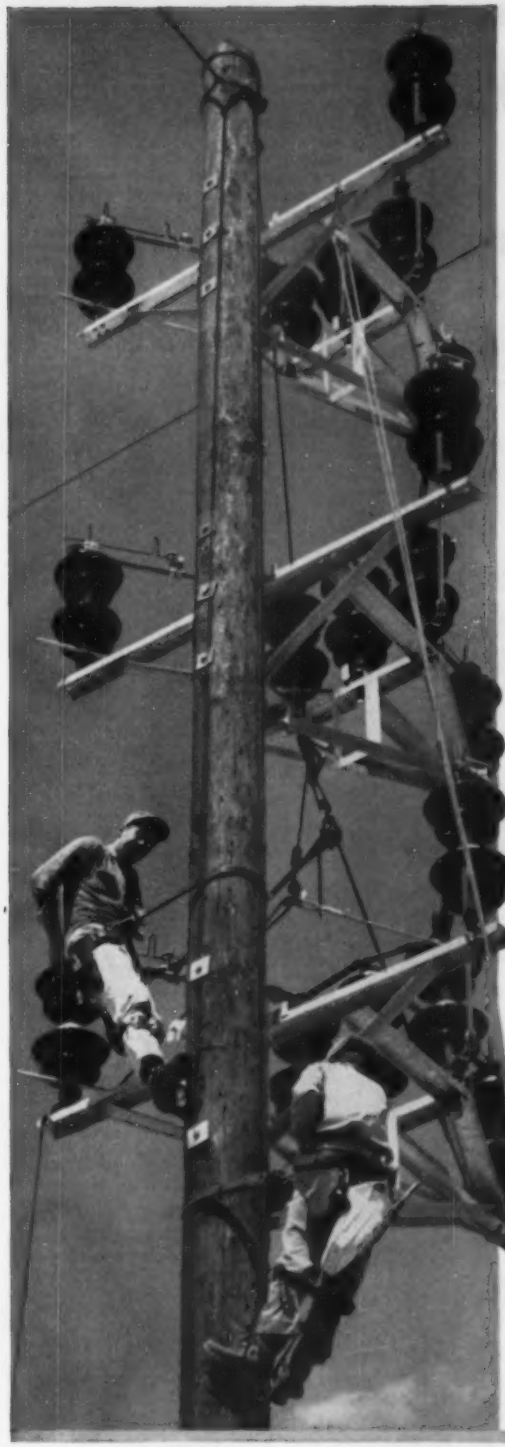
● **INSULATING AND JACKETING MATERIALS:** Bulletin No. WC-1 contains properties of insulating and jacketing materials for wire and cable. Physical, chemical and electrical properties are given for Alathon, Rulan, Zytel and Teflon. Wire coating techniques are covered for each material. E. I. Du Pont de Nemours & Co, Polychemicals Dept, Wilmington, Del.

● **TAP CHANGING EQUIPMENT:** Load tap changing equipment for transformers up to 7,500 kva, for three-phase step regulators up to 750 kva and for all sizes of single circuit unit substations is described and illustrated in Catalog No. 5506, 16 pages. It covers construction, operation and application of Type 220 load tap changers. Included is a section on control equipment, internal views of LTC transformers and an outline of methods of paralleling LTC transformers. Pennsylvania Transformer Co, Box 330, Canonsburg, Pa.

● **CABLE:** Bulletin DM-3556 covers Type N-SD service drop cables. Tables list the various constructions available and give technical data on each type. Cables covered have either copper or aluminum conductors and are insulated with either rubber and neoprene jacket, or with neoprene and polyethelene. Anaconda Wire & Cable Co, Sales Promotion Dept, 25 Broadway, New York, N. Y.

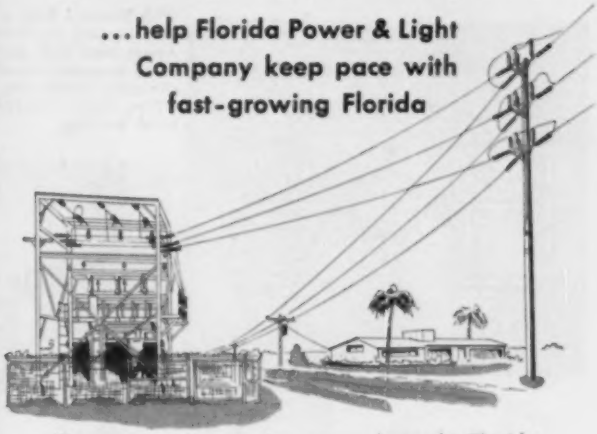
● **SPEED CONTROL:** The installation, performance and maintenance of electronic stepless speed controls for rotating equipment are discussed in Bulletin EC-1. Detailed diagrams are included for all types of Dynamatic eddy-current adjustable speed drives. Eaton Mfg. Co, Dynamatic Div, Kenosha, Wis.

● **INSULATION:** Catalog M-55 gives complete technical data on bonded mica insulation in the form of fabricated parts, plates, sheets, segments, tapes, tubes and V rings. It covers construction and dimensions of each of these parts. Budd Co, Inc, Continental-Diamond Fibre Div, Newark, Del.



GOABS* go up fast, save space, cut costs and give dependable service

...help Florida Power & Light Company keep pace with fast-growing Florida



To meet rapidly growing power demands, Florida Power and Light Company, largest utility in the state, has increased its electric power facilities more than three times in the past ten years, adding 13 new generators. Before 1956 is over, another 80,000 KW will be added. Plans call for a total of 1,122,000 KW to be available by mid 1957.

The use of GOABS on Florida Power & Light's transmission lines has helped to prevent some of the growing pains by reducing switch installation costs, minimizing right-of-way requirements and simplifying switching facilities.

GOABS can be installed for as much as 25% less than conventional-type air-break switches. Substation switching, loop interconnections or sectionalizing can be accomplished from a single switching point. GOABS save costly space, too... one pole can do the job of four. Installation time can be reduced to one-fourth of the time normally required for multi-pole structures. Installation is easy, safe, fast... provides 180° free climbing space... no assembly is necessary on the pole.

You can get GOABS for 1-way, 2-way or 3-way switching in 600 amperes, 15, 23, 34.5, 46 and 69 KV ratings. Bulletin 601-A gives complete information.

*Group Operated Air Break Switches (Formerly Matthews GOABS)

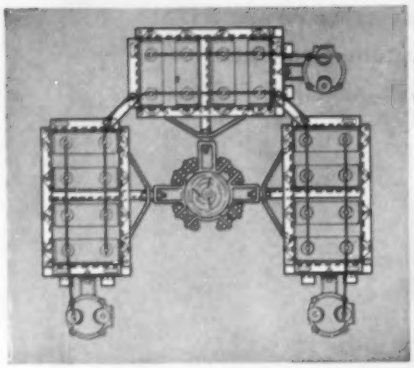
ABC INDUSTRIES

CS55-15

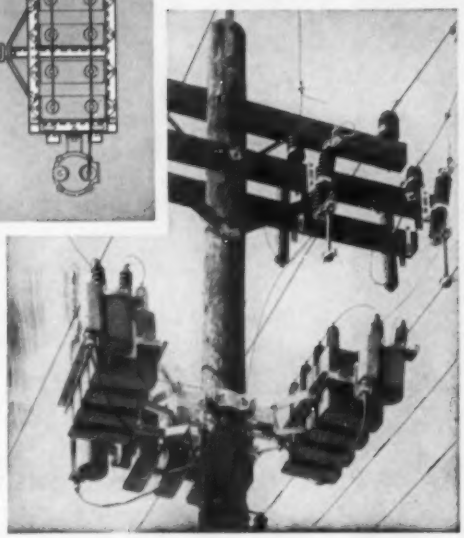
A·B·CHANCE CO.

CENTRALIA, MISSOURI San Francisco, California

HANGING CAPACITORS WITH
UNIVERSAL CAPACITOR RACKS
SAVES UP TO *40%*
INSTALLATION COSTS



With Universal Racks you simplify hanging capacitors . . . Actual labor time greatly reduced by ground assembly and eliminates gaining the pole—drilling holes — excessive material handling.



NO OTHER HANGING METHOD HAS ALL THESE ADVANTAGES

LOWER COST — per overall installation. Actual records prove saving up to 40% over conventional methods.

NO MAINTENANCE — All parts hot dipped galvanized to most rigid A.S.T.M. specifications. Capacitor racks will outlast pole.

LESS POLE SPACE REQUIRED — Allows multiple units to be installed on one pole. All points on top of—alongside—and under capacitors easily accessible.

BETTER WEIGHT DISTRIBUTION — Prevents buckling and/or drifting of the pole. Stronger installations.

VERSATILE — Will mount either standard distribution size capacitor groups. Universal Pole Brackets will fit any pole from 6 to 10½ inches or 9½ to 14 inches in diameter.

There are other advantages to be found in using Universal Pole Brackets and Universal Capacitor Racks. Write now for free catalogue or request us to send a representative to see you. No obligation, of course.

UNIVERSAL
POLE BRACKET CORP.
P. O. BOX 1118—HOUSTON 1, TEXAS

TECHNICAL LITERATURE

EEI REPORTS—The following are available from Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.:

Cable Operation (Publication No. 55-10) covers operating experience with high-voltage (above 7.5 kv between phases) paper-insulated cable, joints and terminations during 1953. Price to members 70¢—others $1.75.

Publication No. 55-6 is a report on polyphase motor starting current rules. Price 25¢.

NEMA STANDARDS—The following are available from National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.:

Coupling Capacitors, Coupling Capacitor Potential Devices and Line Traps, SG 11-1955. Covers rating, testing, manufacturing and performance of these units. Terms used are defined. Price $2.50

Large Air Circuit Breakers, SG 3-1955. Covers ac breakers rated 600 v and less and dc breakers rated 3,000 v and less. Instructions are given for the installation, operation and care of such breakers. Terms used are defined. Price $4.75

Polyphase Motor Starting Current Rules, 151-1955. Report is designed to promote a better understanding of the effect of starting currents in the problems of motor applications. Price 25¢

Primary Unit Substations, 201-1955 to 207-1955. Covers standard equipment, and additional and alternate standard equipment for: (1) Articulated primary unit substations—radial, primary-network, spot-network, low-voltage selective and duplex types; (2) integral primary unit substations; and (3) highway-type mobile primary unit substations. Price $3

PROPERTIES OF STAINLESS WELD METAL—Stress rupture properties of chromium-nickel stainless steel weld deposits are listed on a single data card. The data given is a result of an extensive study of the high-temperature rupture properties of stainless weld metals used to join tubes in steam superheaters, heater coils in oil refinery heaters and high-temperature piping installions. Babcock & Wilcox Co, Tubular Products Div, Beaver Falls, Pa.

WELDING ELECTRODES—"Specifications for Corrosion Resisting Chromium and Chromium-Nickel Steel Covered Welding Electrodes" contains details on test methods, weld metal composition requirements, standard sizes and lengths, packaging, and color markings for identifications. Price 40¢. American Welding Society, 33 W. 39th St, New York 18, N. Y.

EUROPEAN ENERGY PROBLEMS—A 61-page book entitled "Some Aspects of the European Energy Problem" is a report prepared for the Organization for European Economic Co-Operation by Louis Armand, chairman of the board of th Societe Nationale des Chemins de Fer Francais. The report deals with the overall economic aspects of the European situation with regards to energy in its many forms. It goes into the types and quality of energy presently available (gas, oil, hydro, coal), its transmission and its end use. Looking to the future, the report considers the the possibilities of atomic energy from the standpoint of investment required and location in power short areas. Price $1 O.E.E.C. Mission, Publications Office, 2002 P St, Washington 6, D.C.

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- *SUPERIOR STABILITY UNDER HEAT;*
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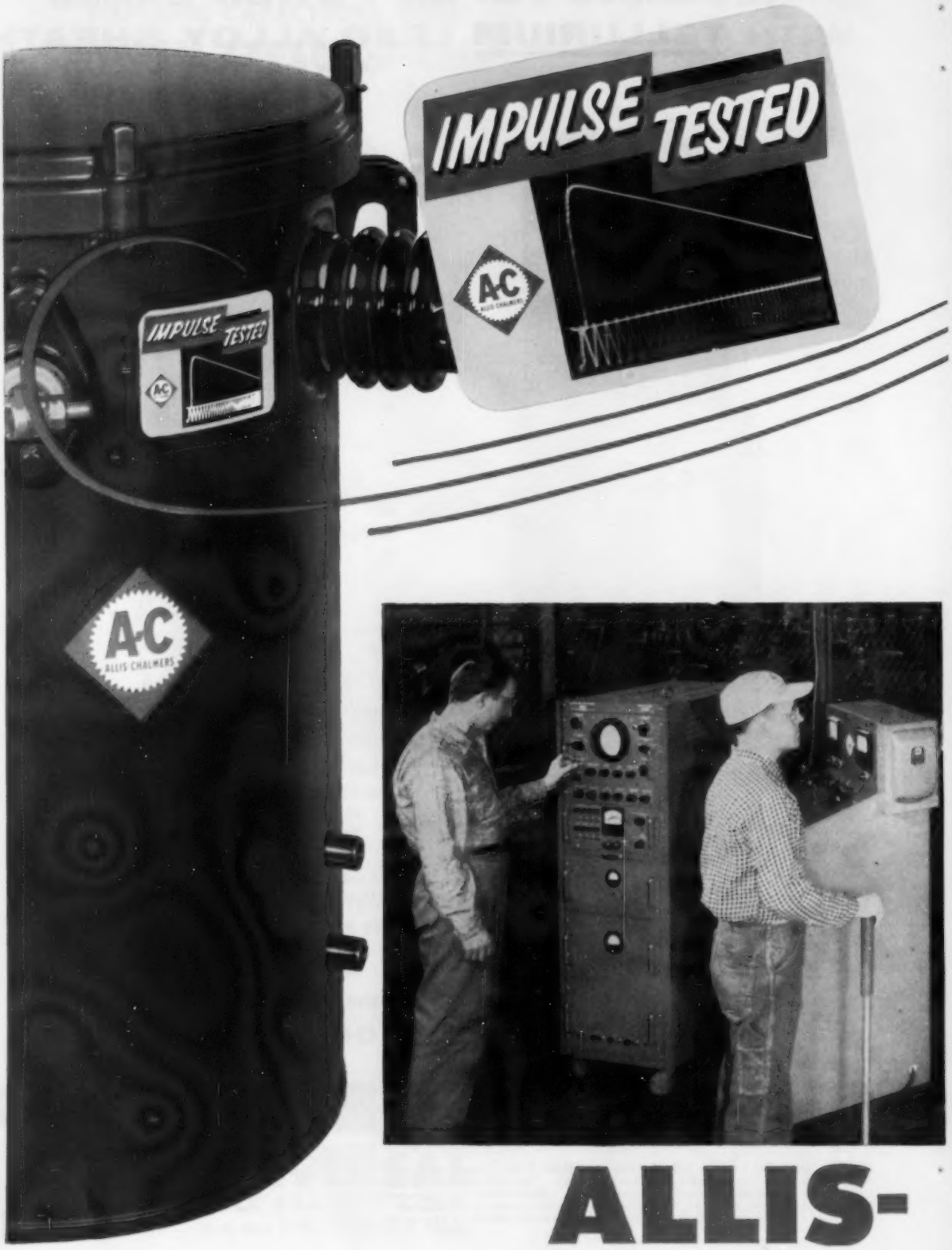

ALLIS-

Now - On Every Allis-Chalmers Distribution Transformer

Now Allis-Chalmers gives you proof that insulation quality has been tested on *every* distribution transformer. The "Impulse Tested" seal on each unit through 500 kva, 69 kv and below, shows that impulse tests were made during production using the most modern impulse testing equipment.

Allis-Chalmers initiated production-line impulse testing eight years ago for pole type units. Now, every unit is shipped with positive assurance that its insulation can withstand severe lightning and line surge conditions. These tests are made on self-protected transformers as well as on conventional units. No lightning arrester is used in these tests. Allis-Chalmers tests only the transformer, not the lightning arrester.

Get the facts about this and other Allis-Chalmers tests and procedures that result in distribution transformers of the highest quality. For more information, contact the A-C office nearest you or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Insulation Quality Is Checked using this testing equipment for all Allis-Chalmers distribution transformers through 500 kva, 69 kv and below.

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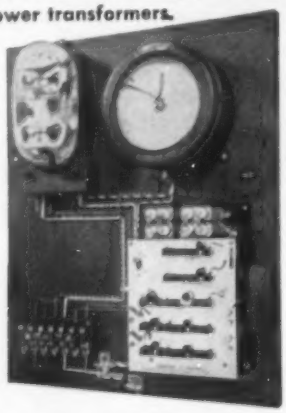
A-C ALLIS-CHALMERS

A-4099

Transformer Loss Compensator

Saves you Money!

BECAUSE it provides an accurate means of measuring the energy and demands of high-voltage services at the low-voltage side of the power transformers.



This installation at 2.3 kv saved about $2600 compared with 34.5 kv metering; it saves about $5500 over metering at 69 kv.

THE TESCO compensator adds to the registration of the watthour meter an amount equal to the sum of the iron and copper losses of the transformer bank. It may be used with practically any type of watthour meter and . . . importantly . . . no changes are made in the meter itself, either structurally or in adjustments . . . It is produced in two and three element types for use with two-element or three-element meters on any type circuit.

Some of the Users . . .

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BOOKS

System Mathematics

Laplace Transforms for Electrical Engineers. By B. J. Starkey. Published by Iliffe & Sons Ltd, Dorset House, Stamford St., London SE1. 279 pages, illustrated. Price 30 shillings.

Engineers today apply network theory to design and operating problems of complex electrical systems almost as their predecessors applied Ohm's Law to earlier systems. In their quest for faster solutions, they have found new use for two classical mathematical methods: functions of a complex variable and Laplace transformations. This book penetrates the screen of mathematical language used by Laplace in 1812 to present his transforms in a vocabulary more familiar to the engineer. Background for it is a series of lectures by the author to his engineering colleagues at the (British) Signals Research and Development Establishment.

Prerequisites for study of this book are differential and integral calculus, complex numbers, and vector analysis. But utility engineers with this mathematical background should find the text and tables of the book helpful in their power system and communications analyses.

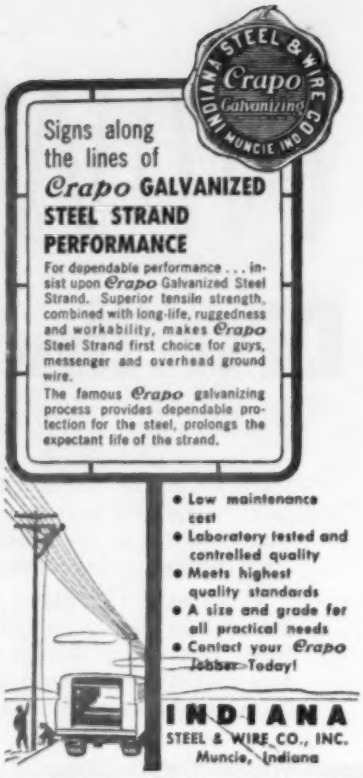
What Makes Cable

Raw Materials for Electric Cables. By A. King and V. H. Wentworth. Published by Ernest Benn Limited, London, England. Distributed in U.S.A. by John de Graff, Inc, New York, N. Y. 362 pages, illustrated. Price $7.00.

The authors have compiled an extensive account of materials used in cable construction. Material for conductors, insulators and for all kinds of protective outer layers are given comprehensive treatment. There are chapters on copper, paper, oils, cambric, rubber (natural and synthetic), thermoplastics, lead, aluminum, and steel. In all 20 different materials or classes of materials are discussed. There is also a chapter on enamelled wire, thermocouples and quality control.

Most chapters follow a set pattern. A short introduction telling what the material is used for and why is followed by sources, manufacturing techniques, mechanical properties, electrical properties, and method of testing.

Four associate authors join the two co-outhors in giving details of the latest practices of British cable manufacturing. But the book is written primarily about the materials themselves. Its comprehensive coverage definitely qualifies it as a reference book of cable materials. However the American engineer will be hampered in using it because standards and bibliography are British and some of the manufacturing methods are apparently not practiced in the United States.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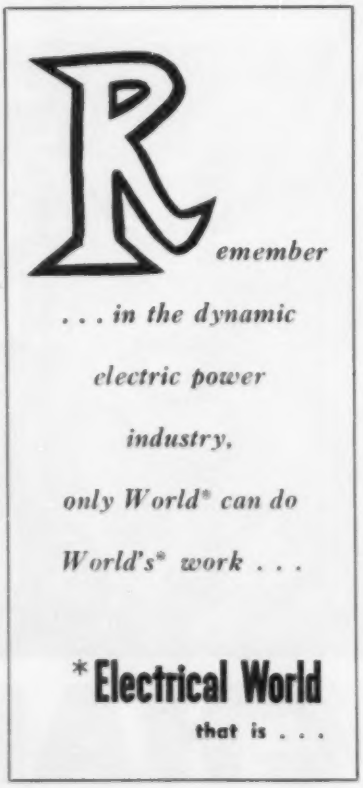


ABC...and the Reader

BACK IN 1914—forty-one years ago—a group of advertisers, advertising agencies and publishers joined in a project that has come to mean a great deal to the millions who, like you, read business magazines. The project, initiated at a time when circulation claims were rarely verified, was intended to achieve and maintain higher standards of integrity in publishing and advertising practice by providing means to audit paid circulation. Out of that effort came an organization known as the Audit Bureau of Circulations, a voluntary, non-profit, cooperative association, known for short as ABC. Its symbol appears at the head of this page.

We are proud that McGraw-Hill publications were among the founders and charter members of the Audit Bureau of Circulations.

Today the Bureau numbers 3,670 members. These include advertisers, agencies, and publishers of newspapers, farm papers, general magazines and business journals such as this one. These publisher members hold their memberships and their right to display the ABC symbol in their publications only so long as they live up to the circulation standards that are established through the Bureau.

It is one thing to set up high standards; it is another to see that those standards are maintained. This latter and all-important function is performed by a staff of auditors maintained by ABC to check periodically on the circulation practices of the publisher members. When a business magazine, such as this one, joins the Bureau it agrees that the ABC auditors shall have "the right of access to all books and records." Their inspection may dig into the files of original subscription orders, payments from subscribers, paper purchases, postal receipts, arrears of payments, editorial expenses and many other significant items. Sometimes the auditors go behind the records and seek verification of purchase and payment from subscribers themselves.

The information thus obtained and certified by the Bureau then becomes available to the public and constitutes an authoritative report on the publication's circulation practices.

The advertisers and agencies benefit directly from the ABC because it provides a generally recognized factual yardstick by which the circulations of member publications can be measured and appraised. Every paragraph in an ABC report on a business publication gives the advertisers data that help them make intelligent use of the publication as an advertising medium.

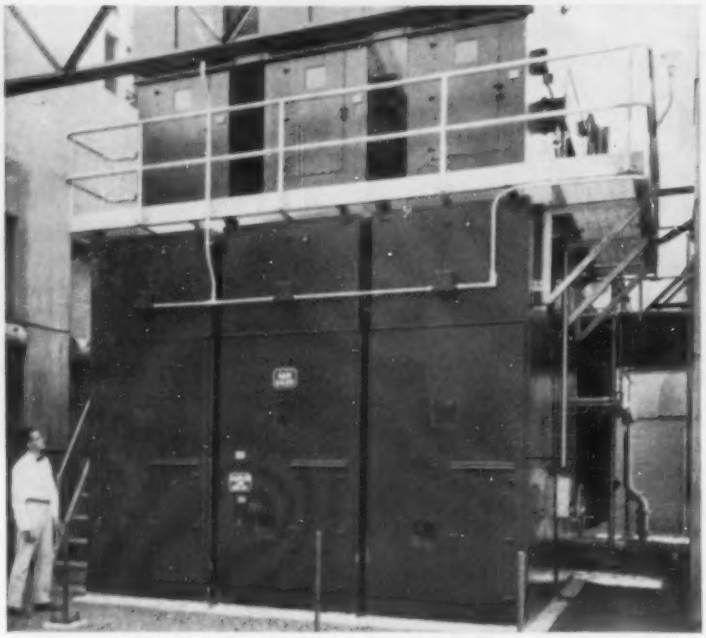
But the ABC renders a service of vital concern to the *reader* as well. The Bureau audits paid circulation only, and it is through this payment, whether by subscription or newsstand purchase, that the reader keeps the editorial policy of a publication responsive to his needs. His decision to buy or not to buy records his judgment on each publication, and the ABC-audited and certified circulation reports make the sum of these judgments known to all concerned.

So the editors of ABC publications must constantly keep their editorial services up to the mark if they are to survive a competition in which the reader's right to buy or not to buy is paramount. Each paid magazine or newspaper will prosper or fail as it wins or loses the voluntary patronage of thousands or millions of readers. And—the ABC is scorekeeper in this vital contest.

Thus the publisher who submits his publication to the supervision and discipline of ABC affirms in the strongest possible manner his recognition that his primary obligation is to his readers and that he owes the standing of his publication to a voluntary demand by those readers.

All this is what makes the ABC brand on a publication so important to its readers. That respected symbol, testifying to the advertising value of the publication, serves also as a constant reminder to all concerned that the reader's willingness to pay for an ABC publication is the basic reason why it stays in business.

McGraw-Hill Publishing Company, Inc.



69-Kv Westinghouse Substation Installed

The installation shown here is an outdoor 69-kv substation with phase-isolated leads having an impulse voltage rating of 350 kv. It was built by Westinghouse Electric Corp and is located at the Penn substation of Philadelphia Electric Co in downtown Philadelphia.

All 69-kv facilities in the substation are metal enclosed to conserve space and provide maximum safety and reliability. The isolated-phase bus encloses the incoming 69-kv cable potheads, line and transformer isolating and grounding switches, and the bus that interconnects these devices and extends to the step-down transformer bushings.

I-T-E Interrupter Cuts Arcing Time to 0.5 Cycle

Interrupting fault current on the first half-cycle of arcing is possible in a recently revealed principle developed by R&IE Equipment Division of I-T-E Circuit Breaker Co, Greensburg, Pa. This principle when adapted to a circuit recloser contributed to the fast interrupting time of one cycle for the recloser, reports the manufacturer.

The new device is known as the single contact-oil column interrupter. During an operation, a tubular contact rapidly moves upward in a vented pressure chamber exposing a column of cool oil to the arc at the point of its highest intensity.

Another feature claimed for the adaption is the reduction of the reclosing interval to 20 cycles. Thus a transient fault is said to be cleared and service restored in 0.333 sec after trouble strikes.

HiperCore Transformer Assembly Line Expanded

HiperCore distribution transformer production facilities are being expanded by the Moloney Electric Co, St. Louis, Mo. The area of a new two-story building will be integrated with the present assembly line. This addition will permit the installation of assembly line testing and allow a substantial increase in production of distribution transformers.

The new facility is expected to be in operation by Feb. 1, 1956.

Owens-Illinois Opens Glass Technical Center

The future looks good for glass. This was the feeling of the Owens-Illinois Glass Co as it opened its Technical Center at Toledo, Ohio, recently.

Oscar G. Burch, O-I vice president in charge of research and engineering, listed the basic factors pointing the way to a new era in glass as: An inexhaustible supply of raw materials; a strength potential many times greater than that yet reached commercially; and the unique properties of glass.

One of the most important phases of work at the new center is the study of glass structure. Here, a complete cycle of glass research and engineering from pure theory to production tests under actual commercial conditions, can be carried on. In addition to making lighter and stronger containers for food and other items, O-I's researchers are aiming to develop glass as a structural material with the load-bearing strength of steel.

The two-story structure houses 50 laboratories and a giant pilot plant in its 200,000 sq ft of floor space.

Dossert Display Truck Completes Southern Tour

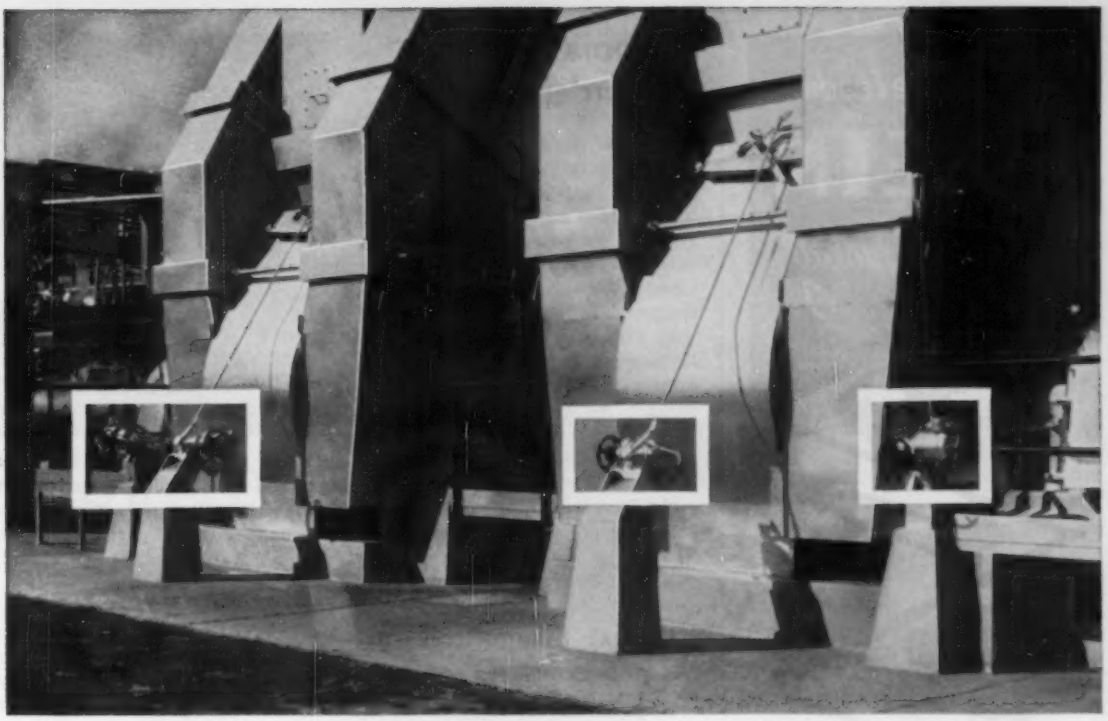
Dossert Manufacturing Co, Brooklyn, N. Y., has had its connector display truck on a southern states tour for a month, reports Howard Grant, sales supervisor for the company. Plans are being made for a trip to Cuba and Canada.

On the truck, electrical connectors of copper and aluminum for distribution substation and underground are displayed for engineers and purchasing agents. The tour covered all utilities in the states of South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas.

Bryant Div. Headquarters

Bryant Division of Carrier Corp will start construction shortly on an administration and engineering building at Indianapolis, Ind., as national headquarters. It will be adjacent to Bryant's manufacturing plant.

(*More M & M on page* 124)



Induced draft fan louvers are controlled by outdoor-mounted Metermax drive units shown above.

HERE'S HOW TO GET

reliable drive unit operation-Outdoors

Metermax Electric Drive Units operate in outdoor locations in spite of snow, sleet, driving rain, and summer sun. They position fan louvers, vanes, dampers, mill feeders, or any other controlled element. And they never quit as long as you give them power.

There's no need for expensive air dryers, jackets, or weather shelters; the units drive in any kind of weather—BARE—and give you continuous, accurate positioning.

At all times, electric drive units provide the instant response necessary for closely coordinated action in large central stations where controlled elements are widely separated.

As for dependability—these drive units operate for long periods with only routine lubrication. Many have been in continuous service—indoors and outdoors—for more than 15 years.

These specific features may interest you:

Self-locking double worm-and-gear drive. *There's no chance of trouble from backdriving. And no locking devices are needed.*

Self-releasing effect of worm-and-gear *permits resumption of remote manual control immediately on restoration of power . . . you don't have to unlock or reset the individual units.*

Simple remote control. *You transfer quickly from automatic to remote manual control by simply turning the control station handle; there's no reset fuss to bother with.*

Compact, functional control station arrangement. *Because the electric control stations require no piping, a close, functional grouping with other motor controls is possible without losing back-of-panel accessibility.*

True position indication. *You always know precisely the position of your controlled elements; electric indicators respond only to actual movement, independent of friction or sticky dampers.*

Low maintenance. *These units have no packing glands, stuffing boxes, or pilot valves. Your maintenance chores are minimized.*

Standard sizes. *Whether for 25 or for 2500 pound-feet, all torque requirements are fully met by these standard drive units.*

If your control needs would be better served by these electric drive units, why not write us about your specific applications? Address us at 4938 Stenton Avenue, Philadelphia 44, Pa.

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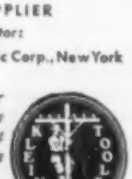

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Ansonia Favors Expendable Reels

Ansonia Wire & Cable Co, Ansonia, Conn., has experienced favorable reaction to its policy of using non-returnable (n-r) reels for shipment of all types of its products. Ansonia has employed the non-returnable reels since 1946, with rare exceptions. Its customers are reported to be satisfied with the policy because their bookkeeping and their reel storage and returning problems have been eliminated. A typical non-returnable wooden reel is illustrated.

Products shipped on n-r reels vary from hook-up wire to submarine cable. Reel loads have ranged from a few score of pounds to several tons per reel. Major exceptions to use of n-r reels were product shipments on certain heavy type reels of steel construction for federal government jobs.

Hotpoint Reorganizes to Meet Business Growth

Hotpoint Co has realigned its organization into product departments, according to a recent announcement by John C. Sharp, president. Sharp said the change was based on predictions of the company's business volume in 1960. The new set-up is designed to permit the growth of the company as business increases.

Each department will operate as an individual business. As a self-contained unit, it will be responsible for all marketing, manufacturing, engineering and financing.

Sharp stated that Hotpoint's 1960 sales goals are entirely realistic and, if anything, are on the conservative side. He said electrical living will make spectacular gains year by year to keep pace with the growth of the nation.

U. S. Copper Production Up

Primary copper production in the United States, according to the Copper Institute, New York City, was 94,755 tons in September, up almost 27,000 tons over August and about 63,000 tons over July which was the lowest this year. Refined copper production was 139,880 tons in September, up from 98,732 tons in August and the year's low of 51,182 tons in July. Deliveries made to fabricators amounted to 144,571 tons in September, compared to 89,348 tons in August, 60,143 tons in July, and an average of 125,800 tons for June, May and April. Refined copper stocks amounted to 53,625 tons in September, up from 49,350 tons in August and 36,293 tons in July.

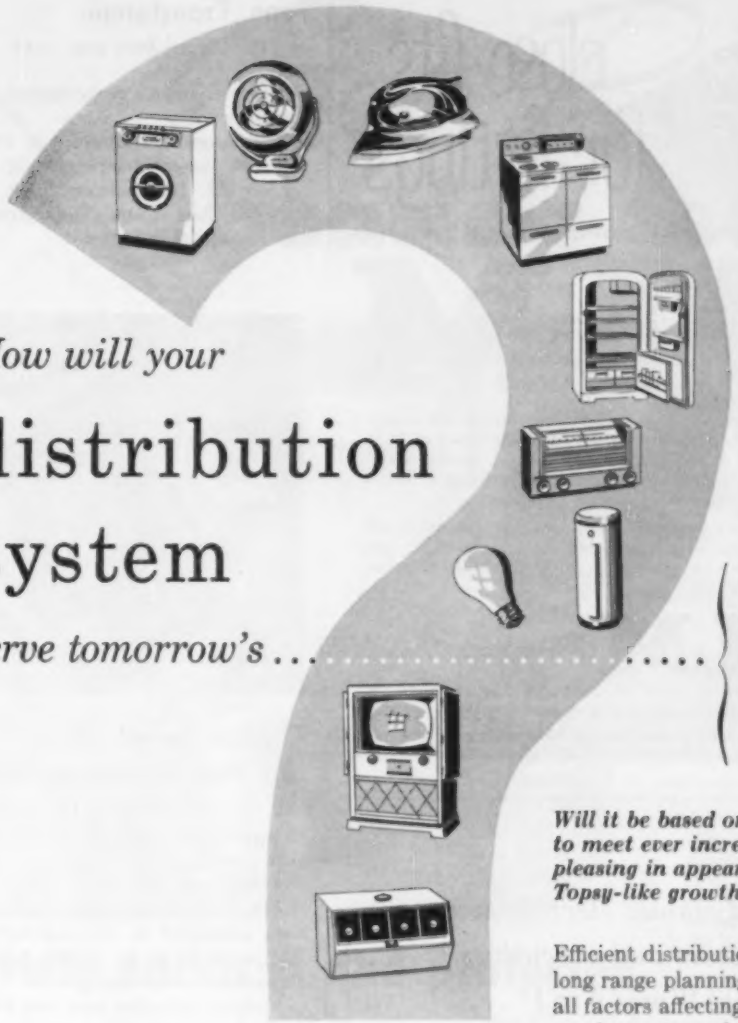
Penn Transformer Gets Award for Dam Units

The Pennsylvania Transformer Co was awarded a $556,868 contract for manufacture of three 103,300-kva transformers for Chief Joseph Dam on the Columbia River north of Wenatchee, Wash. The award was announced by the Corps of Engineers through its district office at Seattle.

Three foreign firms—English Electric Co., American Elin Corp and Ferranti Electric—submitted lower bids to the Corps last April 1. English Electric figured low at $470,965. The award was made to the American firm because it will manufacture the equipment at Canonsburg, Pa., in an area of substantial unemployment, as determined by the Secretary of Labor.

In announcing the contract, W. R. Swoish, Pennsylvania Transformer vice president, said, "The 70,000 man-hours involved in the building of these three 103,300-kv transformers will help maintain employment in Canonsburg and Washington County, which has been certified by the Department

(*Continued on page* 126)



How will your

distribution system

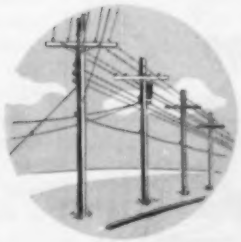
serve tomorrow's . . . . . .

Loads?
Customers?
Needs?

Will it be based on sound planning, ready to meet ever increasing demands? Will it be pleasing in appearance? Or will it reflect Topsy-like growth and soon become obsolete?

Efficient distribution systems are achieved by long range planning and design . . . considering all factors affecting load growth, service requirements, and construction and maintenance practices.

In helping you modernize your distribution system for future demands (whether it's urban, suburban or rural), Ebasco draws upon 50 years of experience throughout the United States and abroad. Let this experience—and the objective viewpoint behind it—combine to assure you of low investment and operating costs.



1905 *Fiftieth Anniversary* 1955

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Narrow bases on these flange terminators permit close mounting . . . eliminate need for bulky potheads in many applications.

close fits for fittings

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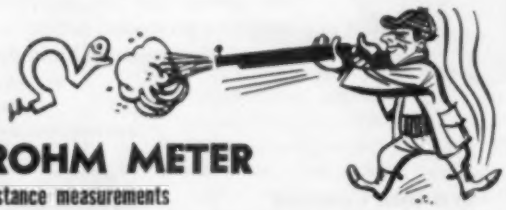
ON A MICROHM HUNT?



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Self-contained Power Supply, Accurate, Portable, Simple to Operate • USED ON: Material Tests, Circuit Breaker Contacts, Cable Joints, Bus Bar Connections, wherever accurate low resistance measurements are required in field or shop.

Non-Destructive Test Instruments for Industry

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J. W. DICE COMPANY

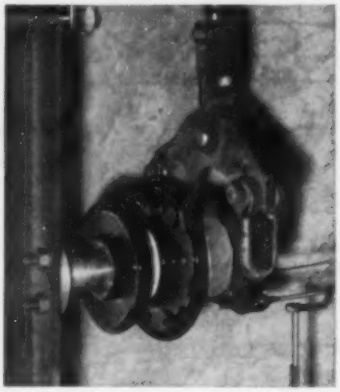
ENGLEWOOD, N. J.

Penn Transformer

(*Continued from page* 124)

of Labor as an area of substantial unemployment."

The three transformers will complete the present complement of 12 for the first 16 generators to be installed at Chief Joseph. Three generators already are in operation.



Thomas Switch Insulator Has New Aluminum Alloy

R. Thomas & Sons Co, Lisbon, Ohio, and Aluminum Co of America were joint sponsors of a series of tests utilizing new aluminum alloys in switch insulator assemblies. The tests were conducted in the high-voltage laboratories of the R. Thomas & Sons Co, insulator manufacturer.

Various destructive tests were made on 15-kv outdoor switch and bus insulators which were using new aluminum alloy caps and pins. These insulators are reported to have met the high voltage insulator standards of NEMA with margin for safety.

Illustration shows switch insulator assembled with aluminum alloy cap and pin being subjected to a cantilever test; deflections were measured to destruction.

GE-Alco Packaged Plant

General Electric Co will supply a 2,500-kw geared-turbine-generator to be used in the proto-type of U. S. Army's first "packaged" atomic reactor being built by Alco Products, Inc. When completed in 1957 the power plant will be located at Fort Belvoir, Va., for training personnel.

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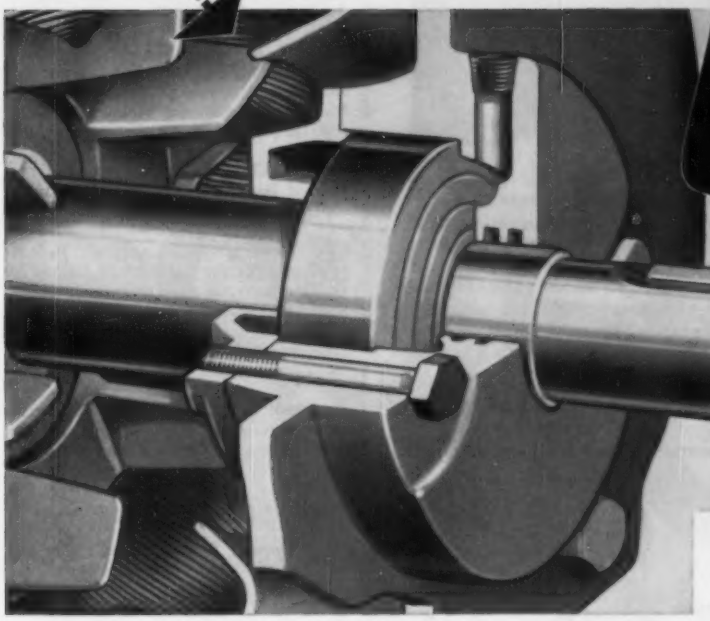
MOTORS



The bearing cap is held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

fully enclosed and protected
. . . yet
easy to grease

You can lubricate the bearings without dismantling the motor. Pipe-tapped holes in the bearing housings at two points provide both means for inserting new grease and a means of flushing out old grease.

Look for the extra bolts on the end housing . . . the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to show you a cutaway section of this maintenance-cutting design. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B6210.

A-4608

ALLIS-CHALMERS

PAGE chain link FENCE

America's First Wire Fence—since 1883

• Security against the ever-present hazards that can damage or destroy property, or injure persons, is a responsibility to assign to PAGE Fence. Whether you choose heavily galvanized Copper-Bearing Steel, corrosion-resisting Aluminum, or long-lasting Stainless Steel, PAGE Fence is quality controlled from raw metal to rugged fence erected on metal posts deep-set in concrete. Available are 8 basic styles, varied by heights, types of gates, top rails, and barbed wire strands for added security. Finally, your PAGE Fence will be expertly erected by a reliable, technically trained firm. For important fence data and name of nearest PAGE firm—

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

fustest with the mostest...

. . . gains many a victory — for manufacturers as well as for the military. In photoelectric lighting controls, for example, Fisher-Pierce was among the first (1945-6) to give street lighting engineers a sound, *dependable* group of controls.

But being among the "fustest," (or "pioneering," as ad men say), isn't in *itself* so wonderful. What it *does* mean is that every Fisher-Pierce control today represents nearly ten solid years of design improvement and millions of hours of actual use. And *that*, to the person who pays the bill, *is* important. Fisher-Pierce will be glad to furnish complete information and technical data.

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Philips Export Corp., 100 E. 42nd Street, New York 17, N. Y.
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SALES ASSIGNMENTS

COMPANY STAFFS

Beaver Pipe Tools, Inc, has appointed William H. Vaught, Sr, district manager for Kentucky, West Virginia, southern Ohio, and southern Indiana with headquarters in Cincinnati.

Line Material Co has designated C. W. Puent field engineer to handle sales in the immediate Chicago area. He has had several years experience as an L-M lighting engineer, both in the field and in the company's main office.

Joseph T. Ryerson & Son, Inc, has named Harold E. Stavers sales manager for the Detroit steel service plant and Homer E. Rieker sales manager at the Cleveland steel service plant.

Sylvania Electric Products, Inc, has appointed Harold J. Ronan lighting sales supervisor for Detroit district.

S&C Electric Co has named T. E. Palmer sales engineer for the State of Ohio. He previously served 18 western Ohio counties. S&C has transferred G. C. Pappas from Chicago to Indianapolis as sales engineer for Indiana and Kentucky territory in association with Palmer.

Wiremold Co has designated Wallace P. Ernsberger sales engineer for the St. Louis trading area and assistant to Kansas City district sales manager. Previously Ernsberger was a sales engineer for Henderson Sales Corp, St. Louis.

Westinghouse Electric Corp has announced these sales appointments: R. H. Johnson, sales engineer in charge of the Saginaw, Mich., office, has been named Detroit area manager for automotive and resale industries; C. F. Smith, sales engineer in charge of the paper industry in western Michigan, has been named Detroit area manager for electric utility and general industrial industries; and John M. Baker has been advanced from salesman to manager of Westinghouse Lamp Division's Omaha sales district. Baker succeeds H. W. Larson who has entered private business in Des Moines, Iowa, as electrical distributor and Westinghouse lamp agent.

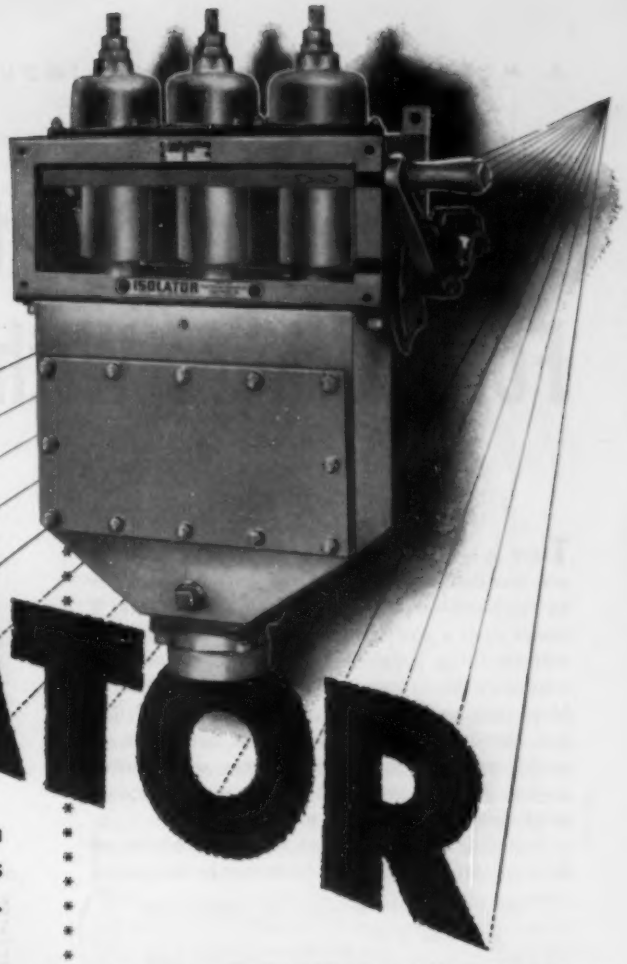
REPRESENTATIVES

Memco Engineering & Manufacturing Co, Inc, has appointed William R. Axford, Jr, P. O. Box 124, Camilla, Ga., as representative in Georgia and Florida.

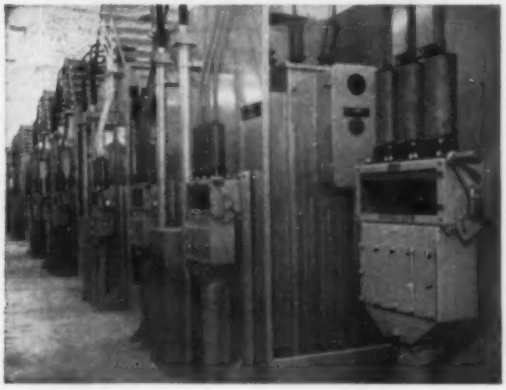
Rumsey Electric Co has made two changes that involve accounts with Allis-Chalmers Manufacturing Co, Delta-Star Electric Co, Lapp Insulator Co, and Sangamo Electric Co. A. B. Tillett, Roanoke district manager, has been named assistant manager, substation transmission and distribution department, with headquarters at Philadelphia. Henry B. Edwards, Jr, has been promoted from the Richmond office to succeed Tillett as Rumsey's Roanoke district manager.

you can do it BETTER with an . . .

ISOLATOR



This is more than just a slogan. In hundreds of electric power installations it has proved itself as more efficient.



Pictured is an installation of CABLE ISOLATORS, one of "Three E" most efficient devices employing ISOLATOR design principles.

Here the Cleveland Electric Illuminating had to provide terminating and disconnecting means for twelve 4600 volt, three conductor cables at one of their strategically located substations. They did it the modern way by using CABLE ISOLATORS.

They —
- Protected live parts
- Saved space
- Saved material by doing the job with one compact double duty device.

"They did it better with an ISOLATOR"

Send for our bulletin 140 and see how you can use the ISOLATOR to good advantage.

ELECTRICAL ENGINEERS EQUIPMENT CO., THREE E **MELROSE PARK, ILLINOIS**

Automation Creates Jobs For Workers With Skills

There is new and reassuring information for those who fear that "automation" – the control of machines by machines – will mean fewer job opportunities. It comes from a special survey of 1,574 companies in metalworking industries recently completed by AMERICAN MACHINIST, a McGraw-Hill publication. More than one-fifth of the companies reported that they already have automatic loading, transfer or assembly machinery in operation. In these companies as a whole there has been a net increase in total employment since this machinery was installed.

According to the AMERICAN MACHINIST survey, of these companies with actual experience in automation

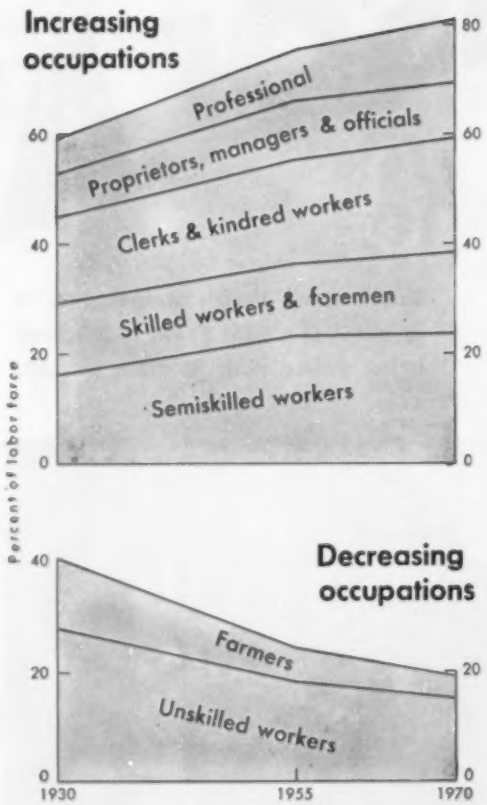
- 26% reported increases in employment averaging 21%
- 51% reported no change in total employment
- 23% reported decreases in employment averaging 16%

More Jobs for the Skilled

Of greater significance, however, is the response by 40% of these companies that they required more skilled maintenance men and by 21% of the companies that they had increased their engineering staffs. This indicates that automation is strengthening a trend already evident in the United States, a trend of expanding opportunity for those with industrial and professional skills and, relatively, of contracting opportunity for the unskilled.

The following chart shows how strong this trend has been over the past 25 years and how strong it may be expected to be over the next 15 years.

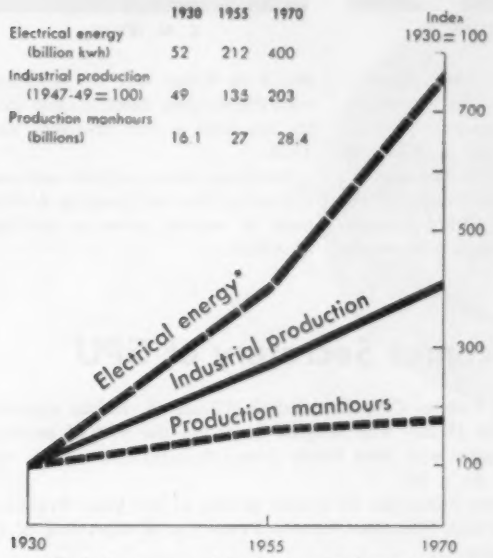
There has been a sharp decline in the percentage of unskilled workers in the nation's labor force and a corresponding increase in the percentage of those with varying degrees of skill.



It is possible, of course, to cite cases of individuals and groups that do not conform to the charted trends. Farmers, for example, are becoming at the same time more skilled and less numerous. But this does not upset the broad proposition that opportunities are increasing for those who have skills.

Power and Production

Much of the basic explanation for the relative expansion of opportunities for those with industrial and professional skills lies in the increasing use of power-driven machinery. This has made possible a vastly greater increase in manufacturing production than in the manhours of human labor devoted to it. The following chart shows the relative increases in electrical energy and manhours of labor used in manufacturing since 1930 and the rise in industrial production.

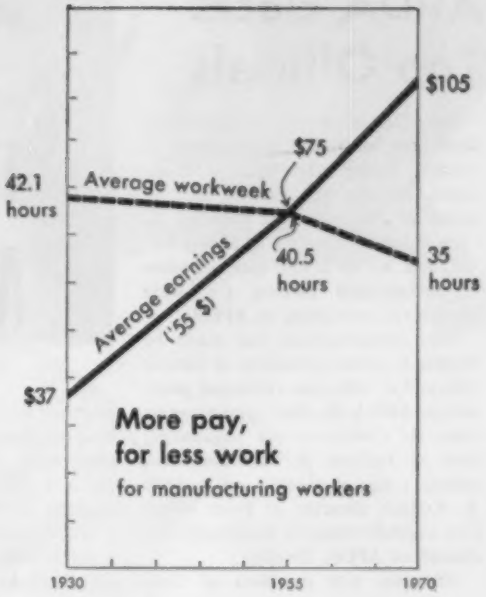


*Excludes power used in aluminum and magnesium reduction, both very heavy power users.

Power-driven machines have reduced the amount of human energy required for physical labor, but they have increased the need for skillful handling and maintenance. As the AMERICAN MACHINIST survey demonstrates, the same is true of automatically controlled machinery.

Higher Wages, More Leisure

The rising average wage of American industrial workers and the decline in hours per week that they must work reflect directly the extent to which the increase in industrial production has outstripped the manhours devoted to it. The final chart shows the increase in weekly wages (in dollars of constant purchasing power) and the decrease in the average workweek in manufacturing since 1930. It also shows the changes that may come in the next 15 years if present trends continue.



There are some who would slow what an earlier editorial in this series characterized as "the continuing process of taking dull and laborious work off the backs and minds of men and transferring it to machines operating in large batteries under automatic control." In doing so, they might make the world safer for those with no skill. The far more constructive course is to welcome the expanding opportunities now being provided and be sure that the nation's young people, who are now starting another school year, are prepared to take advantage of them.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw
PRESIDENT
McGRAW-HILL PUBLISHING COMPANY, INC.

APDA Elects Top Officials

Two electric utility vice presidents have been elected vice presidents of Atomic Power Development Associates. At the first annual meeting James F. Fairman, vice president of Consolidated Edison Co of New York, Inc, and K. M. Irwin, vice president of Philadelphia Electric Co, were elected vice presidents of APDA.

This announcement was made by Walker L. Cisler, president of Detroit Edison Co, who was re-elected president of APDA. In other appointments, John R. Coffin, of the engineering firm of Jackson & Moreland, was named a vice president, and Andrew A. Kucher, director of Ford Motor Co's scientific research laboratory, was elected an APDA director.

J. F. FAIRMAN

K. M. IRWIN

Fairman, vice president of Consolidated Edison since 1946, served as head of Defense Electric Power Administration for 17 months in 1951-52. He is a past president of American Institute of Electrical Engineers.

Irwin was executive director of the London staff, Public Utility Committee, Combined Production & Resources Board in World War II. Associated with Philadelphia Electric since 1931, he has been a vice president since 1948.

Forty-one electric utilities and manufacturing firms are studying development of atomic power as members of APDA.

W. G. KUHNS

Kuhns Becomes Secretary of GPU

General Public Utilities Corp has elected William G. Kuhns secretary. He succeeds Alfred Healey who resigned to accept the post of secretary and assistant treasurer with New Jersey Power & Light Co, a GPU subsidiary (EW, Oct. 24, p 36).

The new secretary joined the GPU staff in July of this year. Previously he was associated with Wisconsin Electric Power Co as supervisor of the utility's Tax Division.

Kuhns was graduated in 1946 from University of Wisconsin's School of Commerce where he majored in public utilities. In 1949 he received a law degree from University of Wisconsin.

Buffalo Forge Ups Heath

W. R. HEATH

William R. Heath, vice president–manufacturing of Buffalo Forge Co, has been elected executive vice president of the company.

Buffalo Forge has also advanced George P. Schively from plant manager to director of manufacturing.

In 33 years with the company, Heath has been assistant chief engineer, chief engineer, director of manufacturing, and vice president.

Worthington Names VP

George F. Habach has been elected vice president in charge of engineering for Worthington Corp. He succeeds Harry A. Feldbush who continues with the technical staff as consultant on special engineering problems.

Associated with Worthington 26 years, Habach has served as chief engineer of centrifugal pump department and manager of engineering, Harrison Division.

G. F. HABACH

Why tie up your money in communications equipment?

When you let the Bell System furnish your communications, you enjoy three important advantages:

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3. *You get the benefits of trained personnel, expert supervision, continuing analysis.*

You don't tie up your money in communications equipment when you use Bell System facilities. This means you free this money to produce income.

A Bell System communications engineer will be glad to survey your communication needs. His study and recommendations are yours without cost or obligation. Call your Bell Telephone representative.

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M. R. NORTON (left), chairman of sales and service section, passes gavel to Almer Skretting, newly elected chairman, at Wisconsin Utilities Association's recent meeting. New vice chairman of the section is A. A. Pfingsten (right)

PERSONAL BRIEFS

American Society of Mechanical Engineers has named **Philip Sporn** winner of the John Fritz Medal for 1955. Sporn, president of American Gas & Electric Co, will receive the medal and honorary membership in ASME at the society's diamond jubilee celebration in Chicago Nov. 17.

Northern States Power Co has expanded its present Minnetonka district into a division with **R. W. Johnson** division manager, **Carl B. Ice** general superintendent, and **Robert C. Howard** division engineer. In another appointment NSP promoted **Lloyd L. Oman** from rate engineer to manager of rate research for the utility.

Southern Indiana Gas & Electric Co has named **N. R. Baum** to the new post of superintendent of electric operations. **Richard H. Schnakenburg** succeeds Baum as superintendent of electric operations–plants and substations. With the establishment of the engineering department as a separate unit of operations, **J. H. Hilton** has been appointed supervisor of the department, and **M. K. Danner** has become chief engineer.

Clyde M. Eppard, general superintendent of Venice Plants, has been named assistant to the vice president, production and distribution, by Union Electric Co of Missouri. **Harry P. Kellogg,** assistant general superintendent at Cahokia, has been picked to succeed Eppard, while **Edward E. Bronkhorst** fills Kellogg's former post.

Polytechnic Institute of Brooklyn recently handed out 16 honorary degrees to mark the closing of its centennial year. Honored with doctor of engineering degrees were: **Philip Sporn,** president, American Gas & Electric Co; **Ernest Van Norden,** retired engineer for Consolidated Edison Co of New York; **Mervin J. Kelly,** president, Bell Telephone Laboratories; and **Thomas E. Murray,** member, Atomic Energy Commission, and holder of over 200 patents.

Dr Alberto F. Thompson has resigned as chief of technical information, Atomic Energy Commission, and joined National Science Foundation as head of the office of scientific information.

Virginia Electric & Power Co has appointed **P. W. Smith** director of agricultural sales and **J. V. Barker** assistant system superintendent–distribution. Previously Smith was director of employee information, and Barker was district superintendent at Newport News.

Francis X. Doherty has resigned from Niagara Mohawk Power Corp to become executive vice president of Atlas Fly Ash, Inc, of Buffalo, N. Y. His firm will market fly ash from the utility's steam plants.

General Electric Co has promoted **W. G. Hart** from sales supervisor to manager, power capacitor sales. He succeeds **F. G. Stebbins,** appointed manager of marketing administration, product service and personnel development . . . **Peter B. Davies,** sales engineer with Philadelphia Gear Works since 1948, has been named to the new post of assistant sales manager.

C. L. Peterson has been appointed vice president and general manager of Brown Instruments Division, Minneapolis-Honeywell Regulator Co. He had previously been divisional vice president.

OBITUARY

Thomas N. McCarter, 88, died last week at Rumson, N. J. He helped organize Public Service Electric & Gas Co, Newark, N. J., and served as president of the utility for 36 years and as chairman for six years.

U.S. Chamber Names Atomic Committee

Appointment of the 1955-56 Committee on Commercial Uses of Atomic Energy, Chamber of Commerce of the United States, has been announced by Committee Chairman **Lewis M. Smith,** president of Alabama Power Co.

The following are among the 19 recent appointees to the committee: **Dr Lawrence R. Hafstad,** general manager, Research Laboratories Division, General Motors Corp; **Alfred Iddles,** president, Babcock & Wilcox Co; **Francis K. McCune,** vice president and general manager, Atomic Products Division, General Electric Co; **Dwight G. Moorhead,** vice president and sales manager, Newport News Shipbuilding & Dry Dock Co; **Philip Sporn,** president, American Gas & Electric Co; **William Webster,** executive vice president, New England Electric System; **Clyde Williams,** president, Battelle Memorial Institute; and **Walter H. Zinn,** director, Argonne National Laboratory.

MEETINGS CALENDAR

OCTOBER

PENNSYLVANIA ELECTRIC ASSOCIATION—Relay Committee, Pocono Manor Inn, Pocono Manor, Pa., Oct. 31-Nov. 1.

THE MAGNESIUM ASSOCIATION—Eleventh Fall Meeting, Hotel Biltmore, New York, N. Y., Oct. 31-Nov. 1.

NOVEMBER

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—Northeast Region Fall Meeting, Hotel Niagara Falls, Niagara Falls, N. Y., Nov. 1-3.

ASSOCIATION FOR APPLIED SOLAR ENERGY—World Symposium on Applied Solar Energy, Westward Ho Hotel, Phoenix, Arizona, Nov. 1-5.

EDISON ELECTRIC INSTITUTE—Taxation Accounting Committee, sponsored jointly with American Gas Association, Plaza Terrace Hotel, Cincinnati, Ohio, Nov. 3; Accident Prevention Committee, Beaumont Hotel, Beaumont, Tex., Nov. 13-18; Commercial Lighting Committee, Terrace Plaza Hotel, Cincinnati, Nov. 16-17; Industrial Relations Committee, Joint Meeting with New England Personnel Group, Somerset Hotel, Boston, Nov. 17-18.

PACIFIC COAST ELECTRICAL ASSOCIATION—Business Development Section Annual Conference, Huntington-Sheraton Hotel, Pasadena, Calif., Nov. 3-4; Hawaiian Section Conference, Reef Hotel, Honolulu, Nov. 9-10; Administration Services Section Meeting, California Hotel, Fresno, Calif., Nov. 16-17.

CONTROLLERS INSTITUTE OF AMERICA—24th Annual Conference, Hotel Statler, Los Angeles, Nov. 6-9.

AMERICAN SOCIETY OF ELECTRICAL ENGINEERS—Eastern Joint Computer Conference, Hotel Statler, Boston, Nov. 7-9.

INDUSTRIAL MANAGEMENT SOCIETY—19th Annual Time and Motion Study and Management Clinic, Sherman Hotel, Chicago, Nov. 9-11.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Diamond Jubilee, Congress, Hilton & Blackstone Hotels, Chicago, Nov. 13-18.

CHICAGO EXPOSITION OF POWER & MECHANICAL ENGINEERING—Chicago Coliseum, Nov. 14-18.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Annual Meeting, Traymore Hotel, Atlantic City, Nov. 14-18.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES—Cable Engineering Section, Bellevue-Stratford Hotel, Philadelphia, Nov. 17.

NATIONAL INDUSTRIAL CONFERENCE BOARD—Bellevue-Stratford Hotel, Philadelphia, Nov. 17.

ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM—East North Central Region, Detroit, Nov. 21-22.

INTER-INDUSTRY FARM ELECTRIC UTILIZATION COUNCIL—2nd Annual National Power Use Workshop, Chase & Park Plaza Hotels, St. Louis, Mo., Nov. 28-30.

AIR CONDITIONING & REFRIGERATION INSTITUTE—9th Air Conditioning & Refrigeration Exposition, The Auditorium, Atlantic City, N. J., Nov. 28-Dec. 1.

ELECTRIC COMPANIES ADVERTISING PROGRAM—Copy Group Meeting, Ayer Studio, New York City, Nov. 30.

DECEMBER

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS—51st Annual Meeting, Hotel Traymore, Atlantic City, Dec. 1-3.

NATIONAL ASSOCIATION OF COST ACCOUNTANTS—Fairmount Hotel, San Francisco, Dec. 2-3.

AMERICAN WATERSHED COUNCIL, INC—Second National Watershed Congress, Statler Hotel, Washington, D. C., Dec. 5-6.

INTERNATIONAL EXPOSITION—25th Exposition of Chemical Industries, Convention Hall, Philadelphia, Pa., Dec. 5-9.

* **NATIONAL ASSOCIATION OF MANUFACTURERS**—60th Congress of American Industry, Waldorf-Astoria, New York City, Dec. 7-9.

EDISON ELECTRIC INSTITUTE—Customer Accounting Committee, sponsored jointly with American Gas Association, Henry Grady Hotel, Atlanta, Ga., Dec. 8-9.

ENGINEERS JOINT COUNCIL—Nuclear Engineering & Science Congress, Public Auditorium, Cleveland, Dec. 12-16.

JANUARY 1956

* **WEED SOCIETY OF AMERICA**—Charter Meeting, Hotel New Yorker, New York City, Jan. 4-5; Northeastern Weed Control Conference, Annual Meeting, Hotel New Yorker, N. Y., Jan. 6.

* **EDISON ELECTRIC INSTITUTE**—Industrial Relations Committee, EEI Headquarters, New York, Jan. 19; Prime Movers Committee, Warwick Hotel, Philadelphia, Jan. 30-Feb. 1.

* **NATIONAL RURAL ELECTRIC COOPERATIVE**—14th Annual Meeting, St. Louis, Jan. 23-26.

* **AMERICAN MANAGEMENT ASSOCIATION**—General Management Conference, Fairmont Hotel, San Francisco, Jan. 24-27.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Winter General Meeting, New York, Jan. 30-Feb. 3.

FEBRUARY

***EDISON ELECTRIC INSTITUTE**—National Indutrial Electric Heating Conference, Netherland Plaza Hotel, Cincinnati, Feb. 6-10; Commercial Lighting Committee, Hotel Shoreham, Washington, D. C., Feb. 15-16.

AMERICAN SOCIETY FOR TESTING MATERIALS—Committee Week, Hotel Statler, Buffalo, Feb. 27-March 2.

MARCH

* **NATIONAL ASSOCIATION OF CORROSION ENGINEERS**—12th Annual Conference, Hotel Statler, New York City, March 12-16.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Edgewater Beach Hotel, Chicago, March 12-16.

ILLINOIS INSTITUTE OF TECHNOLOGY—18th Annual American Power Conference, Hotel Sherman, Chicago, March 21-23.

APRIL

ELECTRICAL MAINTENANCE ENGINEERS ASSOCIATION—8th National Biennial Electric Industry Show, Shrine Exposition Hall, Los Angeles, Calif., April 5-7.

GREATER NEW YORK SAFETY COUNCIL—26th Annual Safety Convention & Exposition, Hotel Statler, New York City, April 16-20.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—2nd Conference on Recording & Controlling Instruments, Bradford Hotel, Boston, April 26-27.

* Additions this week

Nelsen to Talk at Power Use Workshop

Ancher Nelsen, head of Rural Electrification Administration, is slated to speak at the opening general session of the second annual power use workshop. Sponsored by Inter-Industry Farm Electric Utilization Council, the workshop will be held Nov. 28-30 at Chase-Park Plaza Hotels, St. Louis. Other speakers will be: John P. Madgett, manager, Dairyland Power Cooperative, La Crosse, Wisc.; and Edwin Vennard, president, Middle West Service Co, a utility management consultant firm of Chicago.

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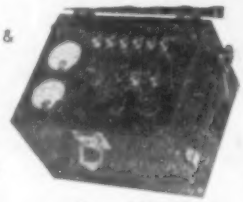

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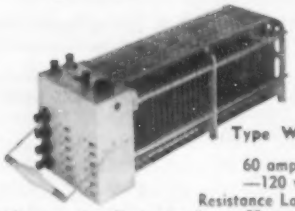
Capacities available: 5-15 and 50 amperes.

Relay Load Kit with inbuilt cycle counter and Ohm-spun load— A handy package!



Type WR

60 ampere —120 volt Resistance Load.

Smooth current adjustment from .05 to 60 amperes.

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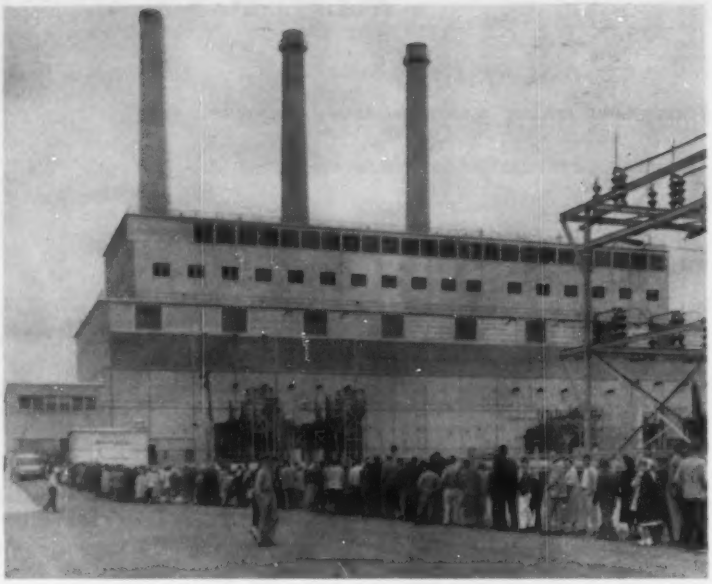
Name ..... Title .....
Company .....
Address .....
City ..... Zone ... State .....



15,000 Visit NSP's Black Dog Plant

More than 15,000 people visited Northern States Power Co's 270,000-kw Black Dog Plant during a recent open house. The event marked addition of a third unit, rated at 100,000 kw, to the $40.5-million power station.

The utility reported that "several thousand people" caught in a traffic jam extending two miles from Black Dog were unable to visit the plant. However, an estimated 120,000 stay-at-homes were able to tour the station via television.

Black Dog went into operation in 1952 with a 70,000-kw unit on the line. A year ago a 100,000-kw generator was added to the coal-burning plant on the banks of the Minnesota River.

Anti-Freeze Spray Fights Alaska Power Plant 'Fog'

Anti-freeze will be used on hot vapors rising from the central heat and power plant at Eielson AFB in Alaska. This plan was developed by Corps of Engineers to prevent an almost impenetrable "ice fog" which develops when the temperature drops to –40F.

The Corps proposes to use triethylene glycol, similar to the familiar permanent type of motor anti-freeze but of different chemical structure, so it will not evaporate in heat.

The triethylene will be sprayed on the hot vapors rising in the stacks of the heat and power plant. It will absorb from the vapors the moisture which, if it escapes in temperatures of –40F or colder, freezes and settles over ground, hangars and air strips in a fog which reduces visibility to as little as 10 ft.

Under the Corps of Engineers plan, the moisture absorbed by the triethylene in the stacks is drained off before it hits the icy air.

Snakes Plague NW Dam

A rattlesnake migration which harrassed workers at Chief Joseph Dam near Wenatchee, Wash., for months has ended temporarily. As water backed up behind the new Columbia River dam, rattlesnakes were flooded out of their rocky caves and swept down stream. Many crawled to the top of the dam where they were killed at the rate of one or two a day by construction workers last summer. Then came unsettling news that some of the snakes had crept into the powerhouse itself. Recently, however, the first cold snap brought relief. For it meant that the snakes would coil into harmless hibernation for the winter.

El Segundo Station

(*Continued from page* 74)

room below the control room houses terminal equipment for control and instrument wiring and piping. This room also contains protective relays for station electrical equipment and transmission lines.

A compact, windowless, centralized control room, 52 ft x 25 ft, on the turbine operating deck is the operating center. A watch engineer, two operators in the control room, and two roving operators comprise the normal shift force for the two-unit station. The control room has a circulating air system which will maintain a positive pressure.

Controls Are Grouped

Instruments and controls for complete supervision and operation of the station and the switchyard have been grouped for operator convenience. Controls and instrumentation for each boiler-turbine-generator-auxiliary generator unit are mounted on a vertical panel 19 ft 4 in. long and 8 ft 8 in. high. Instruments immediately required for operation of the units are located on the control panels while reference instruments are on rear panels.

Six lamp-type annunciator-window groups and an audible chime provide alarm indications. With pressure, flow, and temperature measurements telemetered electrically or pneumatically to the control room, hazards of high pressures or high temperatures in the operating room are eliminated. Closed-circuit television gives the operators views of burner conditions and water levels in the boiler drums.

Communication Methods Many

Communication with the roving operators will be through an interconnected public address and local telephone system. Communication with the rest of the system will be over a multi-conductor cable to a nearby station, which is connected to the company's extensive microwave network, over public telephones, or over power line carrier.

Station lighting is supplied from a lighting control center fed from normal and reserve lighting transformers, which are 4,160-120/208-v dry-type, 3-phase units. In case of failure of both sources, selected emergency lighting circuits will transfer automatically to the station battery.

Fold up your derrick from inside the cab!

with the

TEL-E-LECT STORAGE KIT

The patented Storage Kit fits any standard utility truck body and "A" frame derrick and it can be quickly bolted on the back of your truck by your local mechanic. The derrick will go up or down in a minute or less, entirely controlled by the man in the truck cab. Working with a double drum winch, you get live boom operation—or easily adjustable derrick elevation with a single drum winch. The cost is only a fraction of other, more intricate derrick storing systems—and there's no rebuilding of your present equipment! *Write for details.*

Earth Boring Equipment for All Types of Trucks

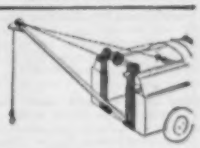
TEL-E-LECT *PRODUCTS, INC.*

10,003 Minnetonka Blvd., Minneapolis 16, Minn.

U.S. Patent No. 2,336,965.

Derrick raised by simply engaging the winch.

Vertical position—winch rotation reversed.



Derrick is locked in operating position.

TRADE MARK REG.

ANCHOR

The Mark Of A Shipshape Job

Cat. No. 2044M

200 Ampere High Capacity Meter Socket with Manually Operated Visible Bypass.

Permits Easy Removal or Replacement of Meter without interrupting Customer's Service.

Illustration shows lower Cover Removed and Meter Bypass Links in Place.

Lower Cover Cannot Be Replaced with Meter Bypass Links in position.

200 Ampere Sockets with Automatic Bypass and with No Bypass Also Available.

FULL INFORMATION ON REQUEST

ANCHOR MANUFACTURING CO., Manchester, N.H.

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant **Civil Service Opportunities** **Employment Agencies**
Positions Wanted **Selling Opportunities Wanted** **Employment Services**
Part Time Work **Selling Opportunities Offered** **Labor Bureaus**

NATIONAL COVERAGE

DISPLAYED —RATES— **UNDISPLAYED**

The advertising rate is $19.15 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to ELECTRICAL WORLD, 330 W. 42nd St., N. Y. 36, N. Y., for November 14th issue closing November 3rd

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1111 Wilshire Blvd. (17)

POSITIONS VACANT

Sales Engineer, technical electrical graduate to cover territory 200 mile radius from New York. Excellent opportunity for man with executive ability, capacity for growth and a sound practical and theoretical engineering knowledge. Reply giving age, experience, etc. P-7959, Electrical World.

Transformer Production Man. Rapidly growing mfg. of power and light dist., dry and liquid filled transformers requires exp. prod. man. Ex. Opp. and future. Write fully in confidence. P-8130, Electrical World.

Plant Accountant and Valuation Engineer. Supervisory position open on staff of mutual service company for electric utilities located in the southeast for engineer with valuation and plant accounting experience. Reply stating age, education, experience, personal particulars and minimum salary expected. P-8007, Electrical World.

WANTED
ELECTRICAL UTILITY ENGINEER
WITH DISTRIBUTION EXPERIENCE
Write:
Chief Electrical Engineer
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
SPRINGFIELD, ILLINOIS

Your Inquiries to Advertisers Will Have Special Value . . .

—for you—the advertiser—and the publisher, if you mention this publication. Advertisers value highly this evidence of the publication you read. Satisfied advertisers enable the publisher to secure more advertisers and—more advertisers mean more information on more products or better service—more value—to YOU.

PERSONNEL MANAGERS

LOOKING FOR ENGINEERS . . . . . TECHNICIANS?

Write for free copy of

"RESERVOIR OF ENGINEERS AND TECHNICAL MEN"

The engineers and technicians you want to reach are gathered in convenient, compact groups—as this 12-page booklet points out.

It keys the job titles these men hold to the McGraw-Hill publications they read for on-the-job information. It explains how you can make contact . . . channel, concentrate your employment advertising to just the men with the job qualifications you want . . . without wasting advertising money for higher-priced space in publications with general circulation, in which you pay for perhaps 999 unqualified readers for every 1 who may meet your job requirements.

Write for your free copy to: Classified Advertising Division

McGRAW-HILL PUBLISHING COMPANY, INC.
330 W. 42ND ST. NEW YORK 36, N. Y.

SEARCHLIGHT SECTION

(Classified Advertising)

(Continued on opposite page)

WANTED

Two Auto Transformers

Rated 60 to 70-115 KV., Three phase, 60-cycle, with a capacity of 30,000 to 50,000 KVA.

Quote price delivery and F.O.B. point to

W-8002, Electrical World
330 W. 42 St., New York 36, N. Y.

FOR RATES OR INFORMATION About Classified Advertising

Contact The McGraw-Hill Office Nearest you.

ATLANTA, 3
1321 Rhodes-Haverty Bldg.
WAlnut 5778
W. LANIER

BOSTON, 16
350 Park Square
HUbbard 2-7160
P. McPHERSON

CHICAGO, 11
520 No. Michigan Ave.
MOhawk 4-5800
H. BOZARTH
W. HIGGENS

CLEVELAND, 15
1510 Hanna Bldg.
SUperior 1-7000
C. J. LOUGHLIN

DALLAS, 2
Adolphus Tower
Main & Akard Sts.
PRospect 5064
J. CASH

DETROIT, 26
856 Penobscot Bldg.
WOodward 2-1793
L. SEEGAR

LOS ANGELES, 17
1111 Wilshire Blvd.
MAdison 6-4323
C. DYSINGER

NEW YORK, 36
330 West 42 St.
LOngacre 4-3000
R. LAWLESS
W. SULLIVAN
D. COSTER

PHILADELPHIA, 3
17th & Sansom St.
RIttenhouse 6-0670
E. MINGLE
J. WILLIS

ST. LOUIS, 8
3615 Olive St.
JEfferson 5-4867

SAN FRANCISCO, 4
68 Post St.
DOuglas 2-4600
R. ALCORN
T. CARMODY

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

UNDISPLAYED RATE:

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.50 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $14.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

SEND NEW ADVERTISEMENTS TO: 330 W. 42 ST., N. Y. 36, N. Y., for November 14th issue closing November 3rd

PERIODICALS

A.I.E.E. transactions back-volume wanted to buy for cash. Ashley, 24 E. 21, N.Y.C. (10).

OFFICIAL PROPOSALS

Bids: November 22, 1955

Power Authority of the State of New York

ST. LAWRENCE POWER PROJECT
ADVERTISEMENT FOR PROPOSALS
FOR
THE FURNISHING AND DELIVERY OF GATE HEATERS AND APPURTENANCES
SPECIFICATION NO. PA-5-14013
ST. LAWRENCE CONTRACT NO. P27

NOTICE TO CONTRACTORS: The POWER AUTHORITY OF THE STATE OF NEW YORK will receive sealed proposals for the design, manufacture and furnishing of Gate Heaters and Appurtenances and delivery thereof, f.o.b. destination in the following ways:

(1) If brought in person on the day of receiving bids until 10:30 A.M., Eastern Standard Time on the 22nd day of November 1955, 270 Broadway, Hearing Room C on the sixth floor, New York, New York.

(2) If mailed in until 10:15 A.M., Eastern Standard Time on the 22nd day of November 1955, at the Authority's office, 270 Broadway, Room 1300, New York 7, New York.

The proposals will be publicly opened and read aloud at the time and at the address given in (1) above. Bids will be entertained for the Gate Heaters, associated equipment and services in accordance with the bidding schedule. Erection at the site of installation will be done by Others but services of erecting engineers shall be provided by the manufacturer if and when required. Delivery of the Gate Heaters and Appurtenances will be required starting July 1, 1956.

Plans, Specifications and Proposal Forms for the work will be on file in the Authority's office and in the offices of the Engineer, Uhl, Hall & Rich, 230 Congress Street, Boston 10, Massachusetts, and the Hydro Electric Power Commission of Ontario, 620 University Avenue, Toronto 2, Ontario, and may be inspected by prospective bidders during office hours, and may be obtained from the Power Authority of the State of New York, 270 Broadway, Room 1300, New York 7, New York, upon application and prepayment of a fee of Ten ($10.00) dollars per initial set of contract documents and Five ($5.00) dollars per set for additional sets, no part of which will be refunded. Two sets must be returned with each bid.

Bids will not be restricted to American manufacturers.

Bids must be made in duplicate upon the proposal forms included in and bound with the Contract Documents. Bid deposit will be required with each bid in an amount not less than 10 percent of the gross sum bid for the schedule.

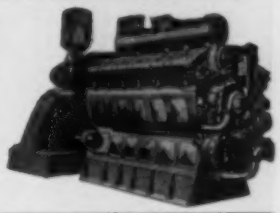
The right is reserved to reject any or all bids.

W. S. CHAPIN
GENERAL MANAGER

PA-5-14013
10/21/55

DIESEL POWER

IMMEDIATE SHIPMENT
• PURCHASE OR RENTAL
UNIT CAPACITIES—10 TO 2475 KVA
A.C.—50 AND 60 CYCLES
• ALSO D.C. UNITS



A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1180	Worthington	SEH-6	1665	360	320	Superior	6GE-6	460	450
1126	Fairbanks Morse	38D	1600	720	300	Fairbanks Morse	32E14	450	300
1100	General Motors	16-278A	1600	720	300	General Motors	8-268A	450	1200
1000	General Motors	16-567B	1440	720	230	Clark	GD-4	375	360
750	General Motors	12-567	1080	720	200	General Motors	6-268A	350	900
700	Worthington	EE-6	1000	327	175	General Motors	12-71	275	1800
675	Fairbanks Morse	38D	900	720	150	Buckeye	80	240	600
600	General Motors	8-567	720	720	148	Fairbanks Morse	32E14	230	300
500	Alco	6-124x13T	750	600	100	General Motors	6-268A	150	1200
360	Baldwin	VO-6	510	450	60	General Motors	6-71	90	1200
320	Enterprise	DSC-6	480	450					

A. G. SCHOONMAKER COMPANY, INC.
DIESEL DIVISION, 50-52 CHURCH ST., NEW YORK 7, N. Y.

FOR SALE

2—15 H.P. Motorized Speed Reducers 1750 to 42 RPM. 230/460 V 3 ph 60 cy
5—20 H.P. Ditto but 1750 to 37 RPM
15—25 KVA West. Dry Type Transformers 2400/4160 to 120/240 V.
7—10 KVA Ditto
9—25 KVA G.E. Pyranol Transformers 2400/4160 to 120/240 V.
1479 ft. #1-3 cond. 3000 V. Neoprene Copper Cable
12,000 ft. #8-3 cond. 3000 V. Neoprene Copper Cable
3045 ft. New #6-3 cond. 3000 V. Neoprene Copper Cable
7—40 H.P. Wound Rotor Motors 900 RPM 220 V.A.C.
5—75 H.P. Squirrel Cage Motors 1800 RPM 2200 V.A.C.
10—Capacitors 7½ KVA 230 V 3 ph 60 cy.
8 Capacitors 15 KVA 2400 V 1 ph 60 cy.
1—4500 Watt Office heater 230 V.
3—3000 Watt Office heaters 230 V.

RODEN COAL COMPANY
MARVEL, ALABAMA

TRANSFORMERS

FOR SALE

3—1000 Kva Mol. 11500-2400/4160Y
3— 500 Kva W-H 33000-2300/2400
3— 500 Kva G-E 23000-2300/4200Y
5— 333 KVA W-H 38000-7200/12470Y
3— 333 KVA G-E 33000-2300/4000Y/6900/11950Y
3— 333 KVA G-E 7200/12470Y-2400/4160Y
4— 333 Kva Wagner 6900/11950Y-7200/12470Y
3— 250 Kva G-E 2415/2300-600
6— 200 KVA G-E 13200-2400/2300
6— 200 KVA G-E 13200-230/460

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio
40 Years' Dependable Service

ELECTRICAL WIRE AND CABLE

—YOUR BEST SOURCE—
• for every industrial and power application
• Odd lengths—long and short—reasonably priced

One of the Largest Stocks in the Midwest

Let us quote on requirements—
send your inquiries
We'll also buy your Surplus

Branch Offices:
Houston—Walnut 3-4580 Los Angeles—ANgelus 3-5148

FOR YOUR TEMPORARY NEEDS TRY OUR SURPLUS DIVISION

UNIVERSAL Wire and Cable Co.
2664M N. Clybourn Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

Save Money — Save Time

Contact us for prices, on large power equipment of all kinds. Prompt shipment from inventory. Send for our complete catalog.

BELYEA COMPANY INC.
51 Howell St. Jersey City, N. J.

HARLLEE BRANCH, JR

CARL J. FORSBERG

PIP Meeting Hits Federalized Power

Speakers urge utilities to step up efforts to give the public true facts to counter frequent misrepresentations and distortions by Federal power advocates

The dangers of an encroaching socialism to the investor-owned electric utility industry and to free enterprise in general were underscored by speakers at the Electric Companies Public Information Program Workshop Conference in St. Louis, Mo., Oct. 5-7.

Keynoting the conference was Carl J. Forsberg, president of Wisconsin Power & Light Co and recently-elected chairman of the PIP Steering Committee. "The big issue of our time," he told the meeting, "is a world-wide war of ideas which is being fought today between two types of capitalism—control by government and control by individual owners. The freedom of men's minds as well as further material progress rests entirely on the outcome."

Unity Urged

Forsberg urged the industry to face up to the need for getting its story across. "We cannot remain divided . . . We must have a sense of individual and company responsibility and a sense of urgency . . . If we have these ingredients, we will present a common front matching that of our opponents. We must face up to the facts and take action to inform the public. All of us have a definite responsibility to pull our own weight. There is too much tendency to say, 'Let George do it.'"

Urging companies to participate in PIP, Forsberg added, "PIP is not, as some may think, a device that you can turn on and off like a faucet . . . a device that you can decide to use or not to use as the occasion requires. It is you, multiplied by the extent of your participation and the cooperation of all of us, and given a common direction . . . a higher voltage, if you will, to meet and defeat an enemy that counts only on keeping us divided in order to conquer."

The conference also heard fighting speeches by Harllee Branch, Jr, president of Georgia Power Co and the Edison Electric Institute, and Rep William E. Miller (R-N.Y.).

Branch asserted that "When we have thought about and talked about (our critical problems), we have talked to ourselves and in a jargon that only we could understand . . . We have been more interested in comfort and convenience than we have in courage and challenge."

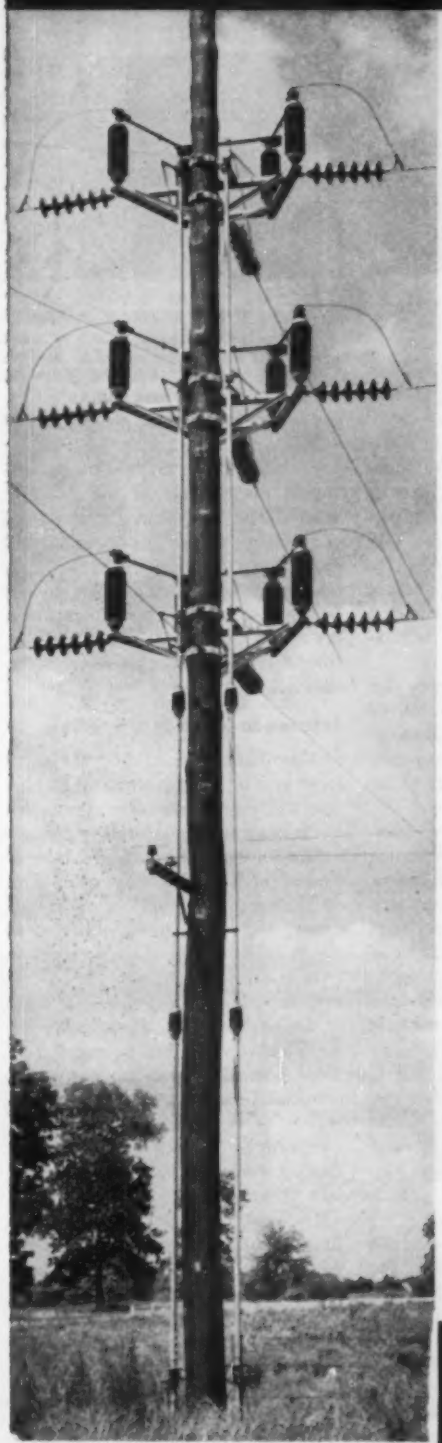
Utilities Must Sell Themselves

The Georgia executive noted that the electric utility industry "has been the most socially conscious of all industries," but "we have neglected the responsibilities of selling ourselves to gain public support and popular acceptance . . . Today we find ourselves the stepchildren and the whipping boy of modern American politics." Branch urged the public relations executives attending to take a strong and positive stand on side of telling story of the industry and the American way of life.

Miller, who has long fought the battle of private enterprise on the Niagara River redevelopment issue (He has sponsored the bill for private development as opposed to state development.), warned against the growth of federal power. "The free enterprise

(*Continued on page* 142)

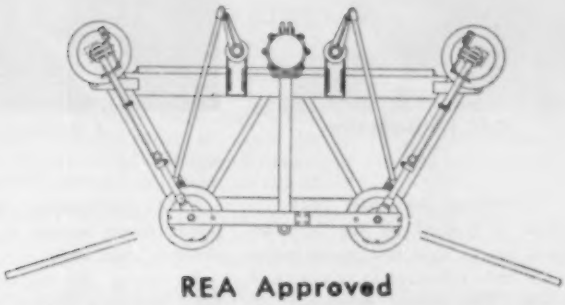
TECO Air Break Switches



Typical 69 KV Installation

Type 2A

HORIZONTAL BREAK
15 KV through 161 KV



REA Approved

CHECK THESE ADVANTAGES-

- ✓ HI-PRESSURE CONTACTS NECESSARY FOR GOOD CONNECTIONS: Rotary motion of blade prior to opening releases hi-pressure beryllium contacts at both ends of blade.
- ✓ DIRECT LINE TO LOAD CONNECTIONS: No mechanical transfer of current thru braid, springs or friction washers.
- ✓ POLE BANDS FOR SWITCH MOUNTING: All TECO air switches are mounted on galvanized cast steel pole bands.
- ✓ ONE PIECE JAW AND TERMINAL OF BERYLLIUM COPPER: Eliminates current transfer thru bolted areas.
- ✓ FOUR-BOLT CONNECTORS OF BERYLLIUM AND CAST COPPER: Two range sizes: from no. 2 strand thru 400 MCM and 3/o thru 750 MCM.
- ✓ TAPERED ROLLER AND BALL BEARINGS AT PIVOT POINTS: Bearings are packed with a special lubricant and require no further attention.
- ✓ DUST AND MOISTURE SEALS IN BEARING HOUSINGS: Neoprene seals protect these bearings at all points.
- ✓ NO LOW CONDUCTIVITY CASTINGS IN CURRENT PATH: All current carrying parts are copper and beryllium copper.
- ✓ DOUBLE SPRING TYPE ARCING HORNS: This type of arcing horn has proven its remarkable ability to interrupt 69 KV. charging currents on long lines, and light transformer loads.
- ✓ INSTALLED SAVINGS: Considerable savings can be yours by using TECO unit air switches. Maintenance free thru years of service.

THE BEST COSTS NO MORE

See Bulletin 101

TURNER ELECTRIC CORP.
P.O. BOX 803, EDGEMONT STATION
EAST ST. LOUIS, ILLINOIS

JOHN THORNBORROW

A. C. INMAN

REP WILLIAM E. MILLER

(*Continued from page* 140)
system as typified by the investor-owned electric light and power industry has been subjected to processes of erosion. This steady, seemingly relentless process of erosion of a field traditionally occupied by private enterprise under our democratic form of government has brought the percentage of public power from less than one per cent to about 20% of the power generated in the United States.

"While yours is the industry directly concerned," the Congressman continued, "it is my belief that the public-private power controversy seriously endangers the foundation of all American industry. Indeed, history may well record that, in a very large measure, the preservation of the private enterprise system itself hinged on the outcome."

Democrat Tactics Cited

While the present Administration had made a real start in returning business to Main Street from Capitol Hill, limitations imposed by a Democrat-controlled Congress hampered the Administration's power policy, Miller noted. He cited the obstructionist tactics by advocates of federal power expansion on such projects as Trinity River, John Day, Hells Canyon, Dixon-Yates, and Niagara.

Public power sponsors revealed more of their true position at Niagara than elsewhere because they could not justify this project on the basis of flood control, navigation, irrigation, or reclamation, Miller pointed out. At Niagara they argued that this "natural resource is 'the people's water.' If this is so, is it not then 'the people's coal;' 'the people's oil;' 'the people's timber;' and 'the people's minerals'?

"The implications, therefore, of public power success at Niagara are obvious," said Miller.

Reviewing the transmission situations prevailing throughout the country, Miller said that where there is public power generation "we find the investor-owned companies as supplicants for wheeling contracts for transmission of power to preference customers. . . . Their own customers receive only what is left of the tax-subsidized power. . . ."

Another speaker, A. C. Inman, vice president and general counsel of Idaho Power Co, gave a detailed analysis of the manner in which public power advocates are distorting the facts in the Hells Canyon case.

"Unfortunately, the power question, in politics, is seldom presented on the basis of facts, full disclosure, or economic evaluation. Rather, it is launched on waves of oratory and dialectics, larded with name-calling and appeals to class prejudice — anything, in fact, to avoid the real fact, that the public power movement, if deprived of its federal cost subsidy, its avoidance of taxation, and of the so-called preference clause—if deprived of these things, public power would no longer be a political issue," said Inman.

Power Issue Not Local

The Idaho Power executive urged the members to remember that "the politics of public power is no longer a local problem that involves one or two companies that happen to be under fire at any given place or time." This is no time to be silent, Inman continued. "Give the people the facts. It is at the grass roots of the nation that these issues will be decided. There's more at stake here than an industry. It's a way of life!" said Inman.

John Thornborrow, manager of public utility investments, Mutual Life Insurance Co, told the meeting utilities should make more of the situation created for them by life insurance companies. "When you consider the investment that life insurance companies, pension funds, and savings banks have made in your companies, it's a safe bet that three out of every four of your customers have an investment in your company."

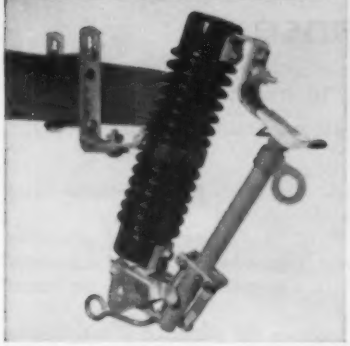
Insurance Spreads Ownership

Thornborrow noted that formerly a large part of the capital funds coming into the capital market was supplied by a small number of well-to-do individuals. "Now the largest source of capital funds is the savings of millions of persons of small or moderate means. . . . This trend, it seems to me, is healthy. The more people who have a financial stake in our system of free enterprise and corporate form of organization, the more secure the American way of life becomes. . . . Your companies are publicly owned companies. Why don't you tell your people about it more. . . . Pride of ownership is one of the strongest motivating forces of human behavior," said Thornborrow.

J. Louis Donnelly, writer for the Journal of Commerce, warned that the power issue will become increasingly prominent in the months before the national elections next year unless the electric utility industry "through its leaders, can demonstrate to the politicians that public power is not a popular issue with their constituents."

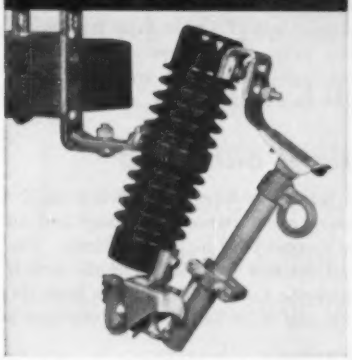
R. D. Furber, Northern States Power Co, presided at the meeting.

NEW HEAVY-DUTY RATING



4000-AMP INTERRUPTING RATING of new 15-kv, 100-amp unit extends range of application of open drop-out cutouts to more points on the distribution system.

HEAVY-DUTY RATING



5000-AMP INTERRUPTING RATING is provided by 7.8-kv, 100-amp unit. Like 15-kv unit it features heavy-duty fuse holder, can be equipped with 100-amp load break or 200-amp disconnect blade.

Now . . . 15-kv, heavy-duty interrupting rating added to G-E open drop-out cutout line

New unit has 4000-amp rating also available with load break

Now you can provide *more dependable* yet *economical* overcurrent protection of equipment *at more points* along your distribution system where the advantages of open-type cutouts are needed, with a General Electric open drop-out cutout.

HEAVY-DUTY RATINGS include the new 15-kv, 100-ampere cutout with an interrupting rating of 4000 amperes and the previously available 7.8-kv, 100-ampere unit with a 5000-ampere interrupting rating.

STANDARD-DUTY RATINGS include the 7.8-kv, 100-ampere unit with its interrupting rating of 3000 amperes plus the 15-kv, 100-ampere unit with a 2000-ampere interrupting rating.

ALL UNITS can be provided with 200-ampere disconnect blades. And all offer the many outstanding design features that have always made G.E. your best cutout buy . . . interchangeable fuseholders in each voltage rating . . . silver-plated contacts . . . birdproof construction . . . compression clamped top and bottom fittings and hanger support . . . permanent high-pressure contact and latch . . . "can't miss" hinge guides . . . and many others.

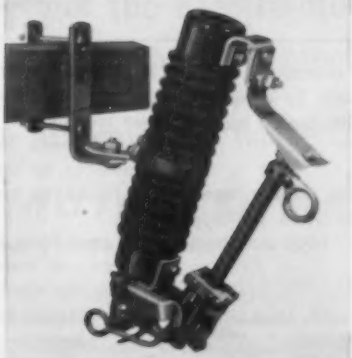
For complete information on these open drop-out cutouts, contact your nearest G-E Sales Representative, or write to General Electric Company, Section 433-14, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

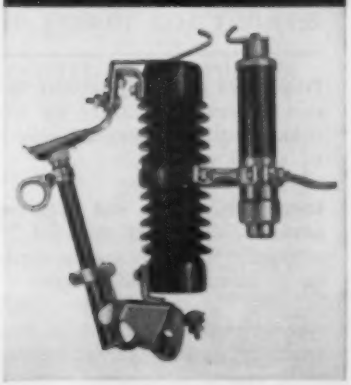
STANDARD-DUTY RATINGS

3000-AMP INTERRUPTING RATING of 7.8-kv, 100-amp unit meets NEMA standards. Interchangeable with 7.8-kv heavy-duty fuseholder.



2000-AMP INTERRUPTING RATING of 15-kv, 100-amp unit has been retained. It can be equipped with 100-amp load break device or 200-amp disconnect blade.

COMBINATIONS



COMBINATION of 7.8-kv open drop-out cutout and 9-kv Hi-stroke arrester can be purchased at less cost than units purchased separately.

WASHINGTON COMMENT

Foes Snipe at Hells Canyon License

Federal power backers think they have legal authority to overturn license in Congress, but the big catch is whether they can muster enough support

Supporters of a high federal dam on the Hells Canyon stretch of the Snake River haven't given up their battle even though a license has been issued to Idaho Power Co for a three-dam development. The federal power crusaders are undertaking a two-pronged attack on the license with every intention of exploiting its full political implications.

National Hells Canyon Association, which lead the unsuccessful battle to head off the license before the Federal Power Commission, is taking its case to the courts. A small coterie of Democrats in Congress are planning a slam-bang campaign to push their high dam bill.

Federal Advocates Seek Legal Basis

While the chances of quashing the license are considered slim indeed, this small group nevertheless is going to a great deal of trouble to marshal arguments for their case. A search for a legal basis for their actions has led the federal power group to these conclusions:

- In general, issuance of the FPC license to Idaho Power Co does not block legislation to authorize a federal project at the same site. There are questions of compensation, of course, but Congress has power to overrule a commission it created.
- This holds even though the Federal Power Act prohibits amendments which would affect a license already issued or the rights of the licensee. One segment of opinion holds that no Congress can bind a future Congress in such a fashion, but any high-dam bill proposed would probably contain a condemnation clause providing compensation for the company.
- Court review of Idaho Power's license could complicate things for a Congress determined to authorize a high Hells Canyon dam. But even a final court decision upholding the license would not interfere with Congress' right to enact an authorization. The federal power advocates claim previous decisions uphold this view.
- Reversal by Congress of a court decision upholding the license would entail larger considerations of compensation than would exist if Congress acted before the courts did.
- Congress could deprive the courts of jurisdiction in pending cases if it wishes. The basis in this case is that the constitution authorizes appellate court jurisdiction but "with such exceptions and under such regulations as Congress shall make."

But even if there should be a legal basis for overturning the FPC license, this could be done only if the federal power advocates muster a majority in both houses of Congress. This they have failed to do in three trys on the federal Hells Canyon bills. The present Congress last year failed to get such legislation off the ground although its members were fully aware that an FPC decision in the case was imminent.

Congress Not Likely to Overrule FPC

What fair-minded legislators have demanded from the start has been an independent engineering study and an expert opinion on the merits of the high vs low dams. This the FPC hearings and decision provided. The decision is greatly strengthened by the fact that it upholds both the staff recommendations and is in line with the examiner's opinion.

Despite the last ditch attempts by the federal power advocates, prospects of any Congressional action upsetting the FPC decision seem more remote than ever.

It would seem much more plausible and appropriate for Congress to pass a resolution commending FPC for an able decision rendered under difficult circumstances.

TECHNICAL NOTES

Proper field preheating requires that a differential expansion between the coils and the field body be established at low speed and maintained while the machine is brought up to full speed.

Instruments, piping, and apparatus for nuclear power cannot be "taken off the shelf." The Arco prototype submarine propulsion reactor required 30,000 new items for its fabrication and assembly.

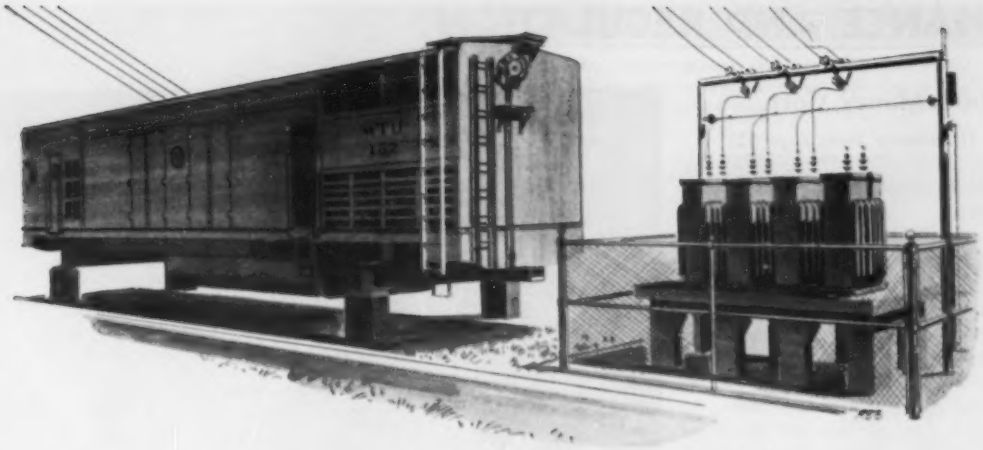
Direct-buried cable should be buried with slack in the trench to allow for ground settling.

Zirconium production before the atomic bomb program was a few hundred pounds per year. In six weeks output attained tonnage quantities with unheard-of purity.

Instantaneous switching from h-v to l-v dc for consolidating cable faults can be accomplished by connecting the two test sources in parallel to the cable. Rectifiers of the l-v source hold it off the cable until the h-v source establishes an arc. De-energizing the h-v source leaves the l-v source in service to maintain the arc.

Hot gases from oil burners resembling gas turbine combustors can boost steam temperature to turbine when starting up after short or over-night shutdowns, as for low-load-factor operation.

Test-out operations of sleet melting give opportunity to detect poor connectors and joints and verify calculated current values before the ice storm hits the transmission line.



1000 kw. at local load relieves central generating station of 1300 kw. during time of peak.

The West Texas Utilities Company has placed an Electro-Mobile power car in service 125 miles from a central generating station. This unit, equipped with automatic control, provides 1000 kw. right at the point of need for peaking, better continuity of service, and voltage regulation.

It can be moved swiftly and economically to any point to fill an unusual or emergency demand.

This versatility of the Electro-Mobile power car makes it the practical answer to many electric utility problems.

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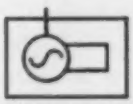
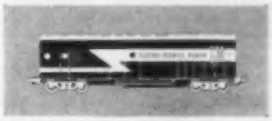
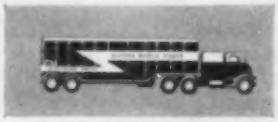


Rail car, truck trailer and portable units—350 to 1,000 kw.





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FINANCE AND REGULATION

Future Money Cost

(*Continued from page 52*)

funds for investment in electric utility securities.

Federal Reserve Board officials recently announced the September-October stock market decline did not warrant any change in policy as to money rates. Moreover retail sales continue to run ahead of last year and other business and production indices are generally favorable.

What does all this add up to on our "when to sell" balance sheet? After guesstimating the assets and liabilities, the compass seems to point to somewhat higher yields for long-term debt and preferred stocks over the next few months, barring an "about face" in the Federal Reserve policy.

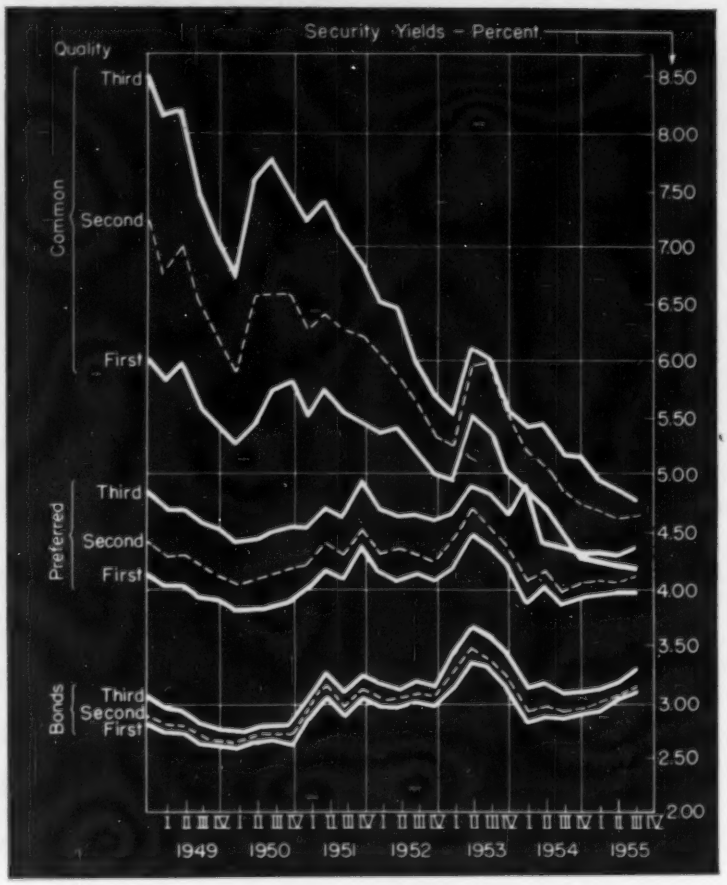
The compass indicates that electric utility managements will probably make no mistake in selling, soon, any long term debt or preferred stock whose proceeds will be needed within the next six months or so. The loss from paying fixed charges on the new securities before funds are required can be largely offset by the current favorable rates obtainable on temporary investments in 91-day Treasury bills, ie, about 2.25%.

An increase in yield of only .01% per annum would more than offset the loss from the excess of a 3.15% yield (Sept. 30 average for second grade bonds) over the return on Treasury bills, for a 30-year first mortgage bond issue sold Nov. 1 if the funds were to be used in equal installments over the next six months.

As to new common stock financing, the colloquialism "what are we waiting for" seems amply applicable. Average price-earnings ratios of electric utility equities may move higher, and yields thereon may fall; but as to most electric utilities, current levels seem so relatively favorable as to warrant prompt action in raising any common stock money likely to be needed within the next year or so.

Where earnings are moving up, temporary dilution should not prove an excessive price for the assurance of raising this "hardest-to-get" segment of utility capitalization on such a favorable basis. This assumes, of course, that dilution of earnings by reason of sale of additional shares would not be sufficient to prevent continuance of regular dividends at current rates.

Yields on second quality common stocks retreated from 4.75% on Dec. 31, 1954, to 4.57% at Sept. 30, 1955. Average yield for first grade utility commons was down to 4.31% at the latter date. These yields comprise an unusually advantageous basis.

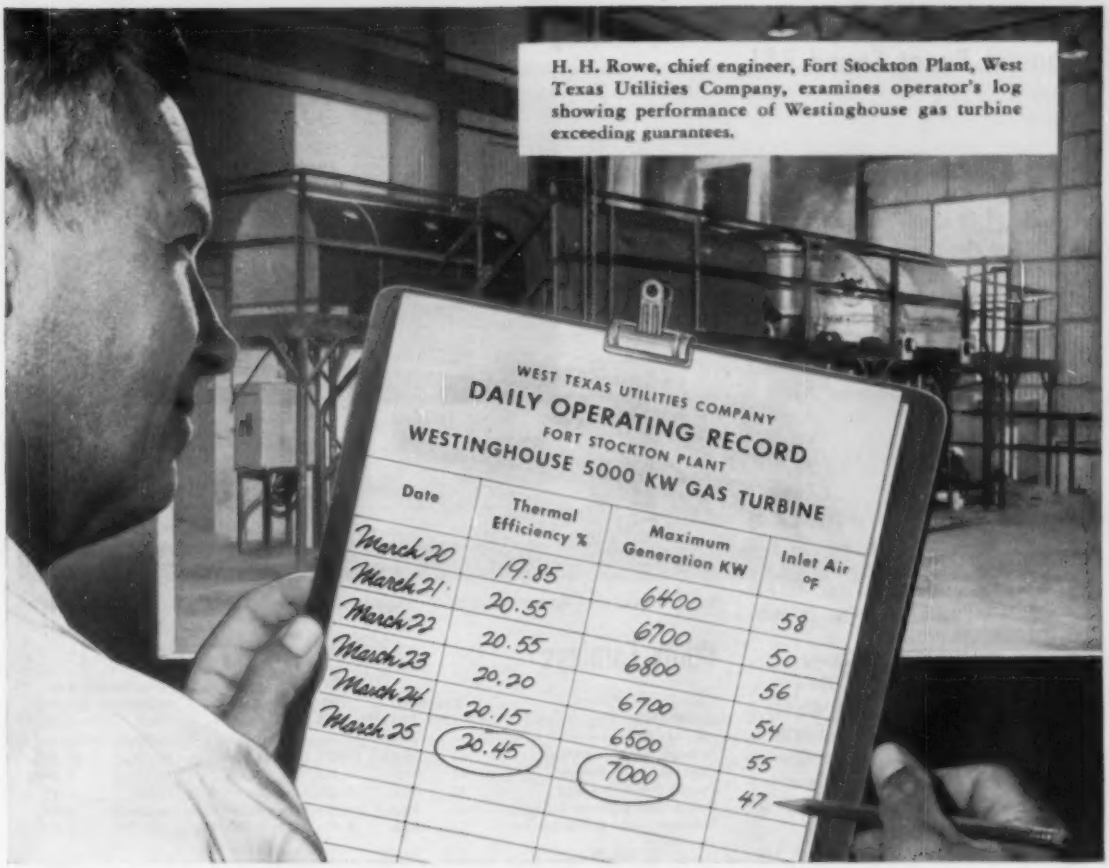


Public Offering—Electric Utility Securities
(Thousands of Dollars)

	Nine Months of 1955			Nine Months of 1954		
	New Money	Other	Total	New Money	Other	Total
Bonds, Notes, and Debentures	514,174(a)	115,396	629,570	864,455	300,595	1,165,050
Preferred Stocks	127,377	9,817	137,194	195,988	146,975	342,963
Common Stocks (b)	228,264	3,150	231,414	334,824	3,932	338,756
Total (b)	**869,815**	**128,363**	**998,178**	**1,395,267**	**451,502**	**1,846,769**
	Third Quarter of 1955			**Third Quarter of 1954**		
Bonds, Notes, and Debentures	38,000	.....	38,000	169,951	79,749	249,700
Preferred Stocks	54,639	.....	54,639	28,203(c)	76,671	104,874(c)
Common Stocks (b)	47,096	.....	47,096	67,142	2,006	69,148
Total (b)	**139,735**	.....	**139,735**	**265,296(c)**	**158,426**	**423,722(c)**

Source: Reis & Chandler, Inc.

Notes—(a) Includes $60 million Commonwealth Edison Co's Gas Divisional Lien bonds now Northern Illinois Gas Co bonds, (b) Does not include sales of stock acquired in exchange for stock of another company, (c) Revised.



H. H. Rowe, chief engineer, Fort Stockton Plant, West Texas Utilities Company, examines operator's log showing performance of Westinghouse gas turbine exceeding guarantees.

FACTS on Westinghouse 5000-kw gas turbines . . .

Exceeds guarantees in first 14,000 hours

Good operating procedures and teamwork with Westinghouse have helped West Texas Utilities Company get top performance from the gas turbine at its Fort Stockton station. The unit is rated 4700 kw at 18% efficiency (3300 ft. altitude). A recent operator's log shows outputs as high as 7000 kw at over 20% thermal efficiency.

This significant accomplishment has been achieved with a minimum of maintenance. In fact, a recent scheduled inspection of the turbine showed this fact:

- Turbine and compressor rotor blading in excellent condition after 14,000 hours' service.

This is proof of the good design and high quality of Westinghouse gas turbines. It is also indicative of how well Westinghouse gas turbines can serve your power generation requirements.

• • •

GET ALL THE FACTS about the good performance you can expect from gas turbines. Call *The Man With The Facts*, your Westinghouse sales engineer, or write for a copy of booklet B-5887, *Westinghouse Gas Turbine Power Plants for Electric Power Generation.* Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pa. J-50577

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PUD Withdraws Suit Against Puget Sound P&L

Douglas County (Wash.) Public Utility District has agreed to withdraw a condemnation suit against Puget Sound Power & Light Co properties following discussions with Chelan County PUD commissioners. Chelan PUD previously had filed condemnation suit against much of the same property Douglas suit covered.

Douglas PUD reported Chelan PUD agreed to provide Douglas up to 60,000 kw from the Rocky Reach dam site on the Columbia River if the project proves feasible.

Hilo Electric—Kona L&P Merger Falls Through

A proposed merger of two Hawaii electrical utilities has fallen through, at least for the present.

With Public Utilities Commission of Hawaii encouragement, Hilo Electric Light Co and Kona Light & Power Co had planned to merge to consolidate all electrical service on the island of Hawaii, biggest and second most populous island of the Hawaiian chain.

Stockholders of the larger Hilo utility voted 86% or 107,358 of their shares in favor of the merger, but the Kona utility fell short of the required 75% approval with only 66% of its shares voting for the merger.

FINANCIAL BRIEFS

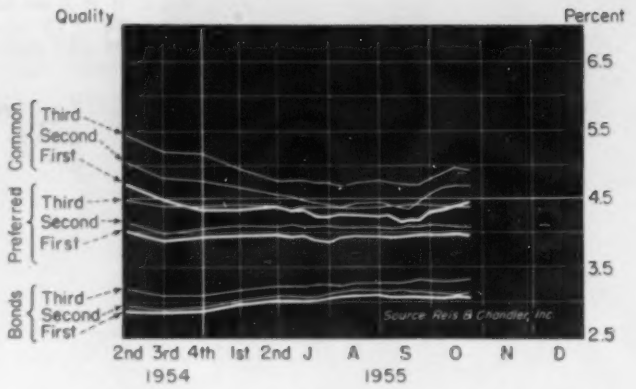
Anchorage, Alaska, voters have approved a $600,000 bond issue to finance expansion of the municipal electrical system.

Upper Peninsula Power Co will pay Nov. 1 a quarterly common stock dividend of 37½¢ a share as compared with 35¢ a share in previous quarter.

Merger of Western Public Service Co, Laramie, Wyo., into Pacific Power & Light Co has been approved by the Federal Power Commission.

Montana-Dakota Utilities Co stockholders have approved the purchase of Montana-Wyoming Gas Pipeline Co on a share-for-share basis.

Today's Utility Yields (%)



	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY.....	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Oct. 20.....	3.08	3.11	3.30	3.97	4.08	4.38	4.43	4.68	4.91
Oct. 13.....	3.08	3.11	3.30	3.99	4.08	4.38	4.41	4.69	4.95

Utility Earnings

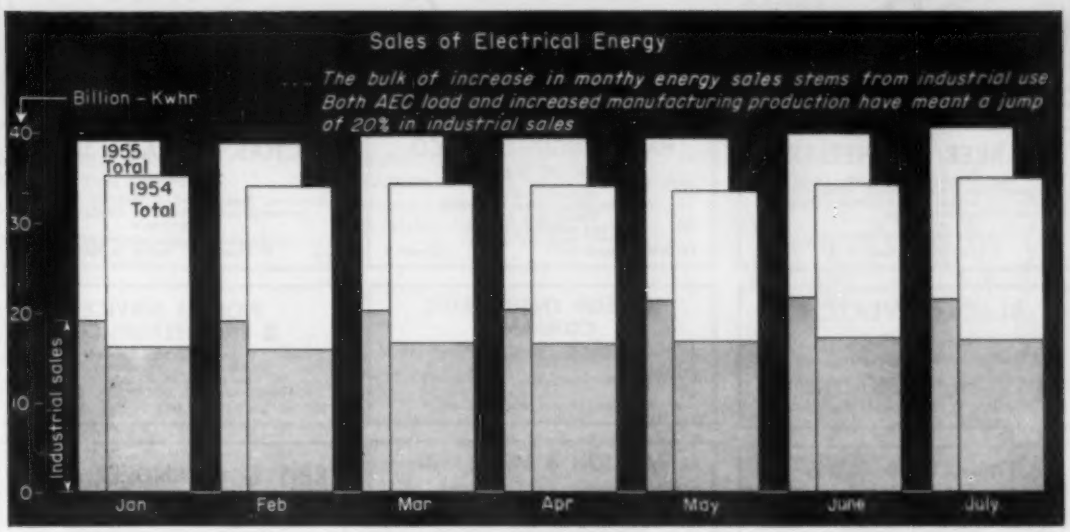
COMPANY	PERIOD MONTHS ENDED		NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
Arizona Public Service.....	12	Aug.	$5,052,000	$4,564,000	$1.37(a)	$1.52(a)
Central Maine Power.....	12	Sept.	6,922,914	5,614,247	1.83(c)	1.49(c)
Pacific Power & Light	12	Aug.	6,196,580	5,769,081	1.66	1.54
Puget Sound Power & Light ...	12	Aug.	4,828,451	4,210,377	2.22	1.93
Western Light & Telephone ...	12	Aug.	1,474,243	1,190,448	2.56(b)	2.24(b)

Notes—(a) Based on average number of shares outstanding during the period; (b) Based on 458,172 in 1955 and 393,244 shares in 1954 and (c) Based on 3,009,337 shares to be outstanding after the current sale of 506,317 shares.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
OCTOBER 20-26			
BONDS			
Long Island Lighting—1st mtg due 1985.....	$15,000	(See Electrical Week page 45)	
PREFERRED STOCK			
Pacific Gas & Electric—1,000,000 sh 4.36% $25 par.....	$25,500	$25.50	4.36%
SCHEDULE FOR OCTOBER—NOVEMBER—DECEMBER			BID DATE
BONDS			
San Diego Gas & Electric—1st mtg due 1985.....	$18,000	.....	Nov. 29
Delaware Power & Light—1st mtg due 1985.....	10,000	.....	.....
PREFERRED STOCK			
Virginia Electric & Power—125,000 sh $100 par.....	$12,500	.....	Dec. 6
Delaware Power & Light—50,000 sh $100 par.....	5,000	.....	.....
COMMON STOCK			
Indianapolis Power & Light—209,686 sh (to be offered commonholders on 1-for-15 basis, record Oct. 27 to expire Nov. 10).....	.....	.....	.....
Southern Co—1,507,303 sh (to be offered commonholders on 1-for-12 basis, record Nov. 1 to expire Nov. 22).....	.....	.....	.....
Commonwealth Edison—1,110,375 sh (to be offered commonholders on 1-for-15 basis, record Nov. 1 to expire Nov. 16).....	.....	.....	.....
Rochester Gas & Electric—200,000 sh (to be offered commonholders on 1-for-7 basis).....	.....	.....	.....

STATISTICS



Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Aug.	110.03	108.79	98.0	12.2
Peak—Class I Systems (million kw)	July	89.3	86.6	78.2	14.2
Estimated Dec. '55 Peak (million kw)	July	96.3	96.6	96.1	0.2
Production—billion kwhr	Aug.	49.35	46.63	41.17	19.8
Hydro		9.53	9.35	8.34	14.3
Fuel		39.82	37.28	32.82	21.2
Sales—billion kwhr	July	40.89	40.17	35.01	16.8
Residential		9.89	9.57	9.11	8.5
Commercial		6.92	6.48	6.40	8.0
Industrial		21.50	21.75	16.97	26.7
Other		2.59	2.38	2.51	2.9
Fuel Consumption	July				
Coal—million tons		11.72	11.07	9.41	24.5
Oil—million barrels		4.62	4.69	4.44	3.9
Gas—billion cu ft		126.25	107.42	128.36	—1.6
Net Income Class A & B Co's—$ million	July	89.87	96.75	83.84	7.2
Residential Customers—millions	12 mos.	43.83	43.74	42.57	3.0
Revenue per kwhr	ended	2.66¢	2.67¢	2.71¢	—1.9
Avg kwhr per customer	July	2,662	2,649	2,459	8.3
Avg annual bill		$70.81	$70.73	$66.64	6.3

Business Statistics . . .

Indexes: 1947-49 = 100					
FRB Industrial Production	Sept.	141	139	126	11.9
ENR Construction Cost	Sept.	141.0	141.0	134.3	5.0
BLS Cost-of-living	Aug.	114.5	114.7	115.0	—0.4
NEMA Sales	Aug.				
Insulation materials		147	117	111	32.4
Electric appliances		111	97	91	22.0
Household refrigerators		86	89	71	21.1
Wholesale prices	Aug.				
Motors and generators		121.5	121.5	123.1	—1.3
Transformers and regulators		127.3	127.3	128.1	—0.6
Switchgear and fuses		139.2	135.5	135.1	3.0
GNP—annual rate—$ billion	2nd Qtr.	$385.0	$375.3	$357.6	7.1

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DUXSEAL is a non-hardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package, for smooth, workmanlike jobs.

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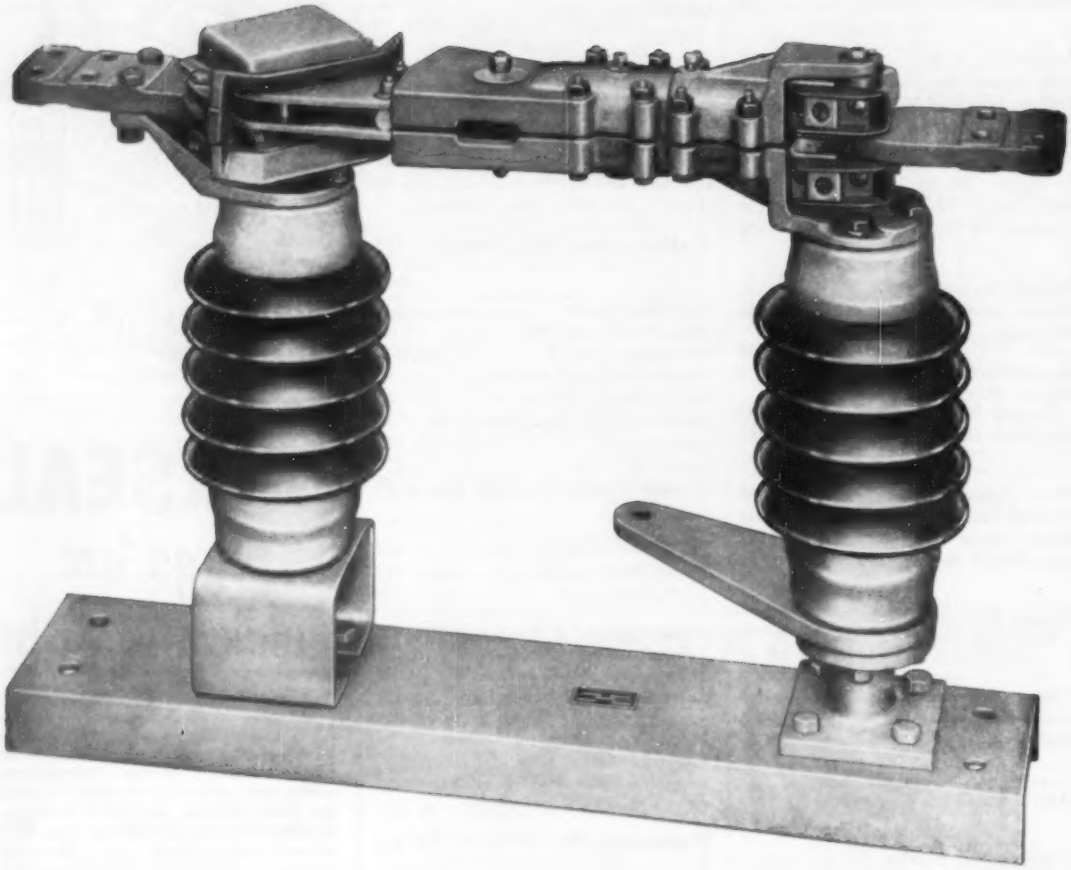

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15,000 Volts 1200 Amperes Type LU

Side Break—Three Pole—Single Throw—Group Operated

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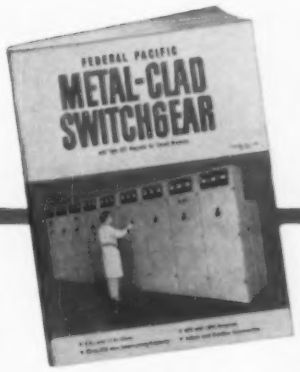
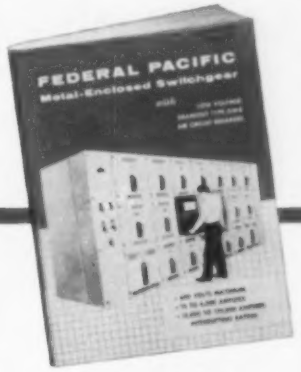
Here are complete, factual and useful data. Send coupon for any one or more of the bulletins that you need.



NEW!

40-page bulletin on 5 kv and 15 kv metal-clad switchgear equipment. Information includes complete details on the Federal Pacific DST Air Circuit Breaker together with a description of the Solenarc principle of arc interruption.



NEW!

This 42-page bulletin describes Federal Pacific 600-volt Drawout Switchgear . . . gives detailed description of DMB Air Circuit Breakers . . . includes a handy breaker selection table based on new proposed NEMA ratings.

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A comprehensive 96-page bulletin giving actual layout, installation and ordering information that can save hours of your engineering time when laying out the newest, most economical distribution system that has ever been devised.

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- ☐ New Metal-Clad Switchgear Bulletin
- ☐ New Metal Enclosed Switchgear Bulletin
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Name_____ Title_____

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Address_____

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Federal Pacific products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct, High Voltage Circuit Breakers and Power Switches ★ Sales offices in principal cities.

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engineered for top performance... built for long life

Rigid, sturdy construction

1. Leads and lead guides well supported with sufficient electrical clearance.
2. Core clamps prevent shifting or vibration.
3. Pressure studs and steel clamping rings hold coils solidly in place.
4. Tank of heavy steel plate reinforced by fabricated channels.
5. Keyed radial spacers support, separate, and firmly anchor individual coils.
6. Heavy tie rods to resist short circuit and lifting forces.
7. Rigid insulating blocks between coil stack and steel clamping ring.

High electrical efficiency

8. Continuously wound coils with minimum electrical resistance and neat coil section connections.
9. End coils reinforced for surge protection.
10. Static shield for voltage stress equalization at high voltages.
11. Cable lead connections brazed or crimped.
12. Core of laminated oriented steel with cruciform cross section.

Coordinated insulation

13. Insulation barrier between high and low voltage windings.
14. Core insulation.
15. Barrier between high voltage coils.
16. Insulation between core yoke and coil stacks.
17. Detachable core grounding strap.

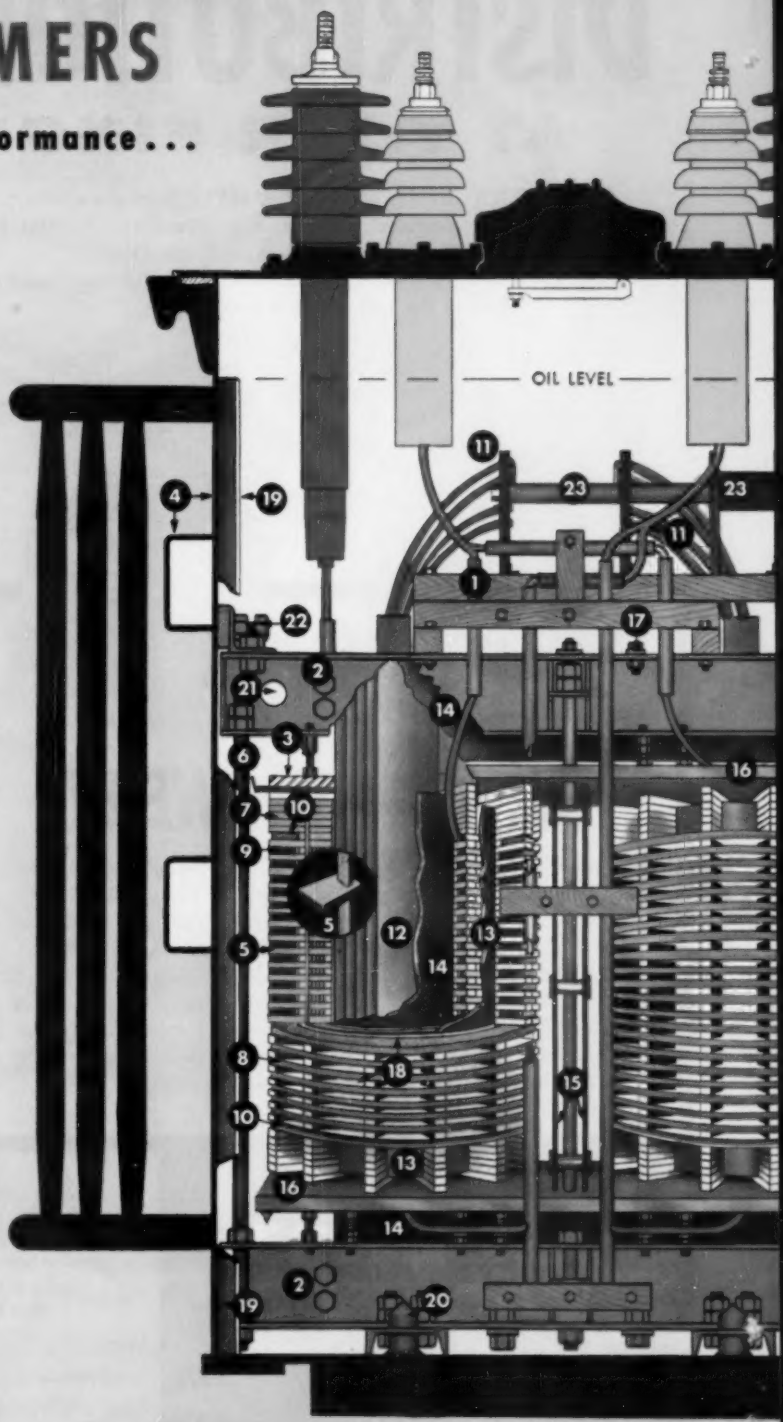
Entrapped moisture and air forced out by heat and vacuum treatment.

Good thermal protection

18. Large ducts formed by radial and vertical spacers assure good circulation to all parts of the windings; thus eliminating danger of "hot spots".

Accessible and easily handled

19. Guide for lowering core and coil into tank.
20. Pins for positioning core and coil.
21. Core clamp lifting eye.
22. Tank anchor bolt locks core and coil to tank.
23. Tap changer at top of core and coils for ease of inspection.



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